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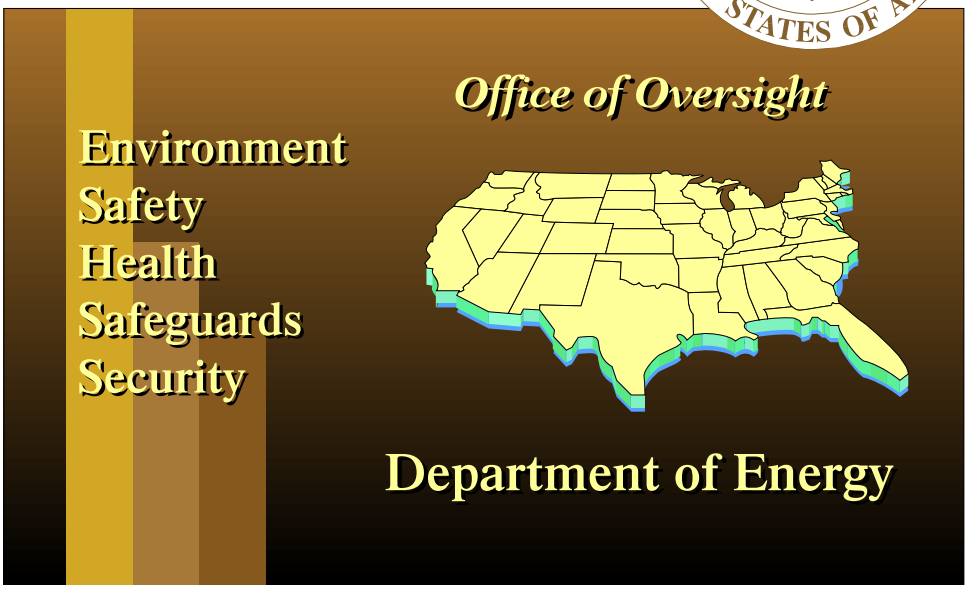
OVERSIGHT

Special Review:

Safety Management Evaluation of Facility Disposition Programs at the

East Tennessee Technology Park

September 1997



Office of Environment, Safety and Health

OVERSIGHT

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Abbreviations Used in This Report

ASA	**Auditable Safety Analysis**
BNFL	**British Nuclear Fuels, Limited**
CERCLA	**Comprehensive Environmental Response, Compensation, and Liability Act**
CROET	**Community Reuse Organization of East Tennessee**
DNFSB	**Defense Nuclear Facilities Safety Board**
DOE	**U.S. Department of Energy**
EH	**DOE Office of Environment, Safety and Health**
EM	**DOE Office of Environmental Management**
EPA	**U.S. Environmental Protection Agency**
ES&H	**Environment, Safety, and Health**
ETTP	**East Tennessee Technology Park**
GAO	**General Accounting Office**
HVAC	**Heating, Ventilating, and Air Conditioning**
LMES	**Lockheed-Martin Energy Systems**
OR	**DOE Oak Ridge Operations Office**
ORPS	**Occurrence Reporting and Processing System**
OSHA	**U.S. Occupational Safety and Health Administration**
PCB	**Polychlorinated Biphenyl**
RCRA	**Resource Conservation and Recovery Act**

Executive Summary

REVIEW:	Office of Oversight review of safety management of the efforts to disposition surplus facilities
SITE:	East Tennessee Technology Park, Oak Ridge, Tennessee
DATES:	May - June 1997

Scope

The Department of Energy (DOE) Office of Oversight reviewed safety management programs at the East Tennessee Technology Park (ETTP). Safety management at ETTP is the responsibility of the DOE Headquarters Office of Environmental Management (EM), the Oak Ridge Operations Office (OR), and the contractor who manages and operates the site, Lockheed-Martin Energy Systems (LMES). The review focused on safety management aspects associated with efforts to clean up, maintain, and reuse ETTP facilities that are no longer required for their original mission.

Background

The original uranium enrichment mission of the ETTP site, formerly known as the Oak Ridge Gaseous Diffusion Plant and later as the Oak Ridge K-25 Site, ended in 1987. Since then, ETTP has focused on managing radioactive wastes, maintaining facilities pending decisions about their disposition, characterizing hazardous materials and conditions, and preparing for decontamination and decommissioning and the eventual restoration of the site for future utilization as deemed appropriate by DOE. The recent change in the name of the site from the K-25 Site to the East Tennessee Technology Park (ETTP) was symbolic of an evolution in the site mission, which now emphasizes "reindustrialization." Reindustrialization involves leasing space and equipment within ETTP facilities as part of a strategic plan to reduce the cost of site cleanup through partnerships with private industry.

Leasing has been facilitated through a leasing agent, the Community Reuse Organization of East Tennessee (CROET). Over the last year, OR has increasingly shifted the site mission and management focus and efforts, and has provided resources to the reindustrialization program.

Results

Over the last four years, OR and LMES have demonstrated a limited amount of progress in their effort to decontaminate and decommission radiologically contaminated buildings slated for demolition. The most notable success was the demolition of non-contaminated facilities such as the power plant and cooling towers, which was accomplished through an innovative approach to fixed-price contracting. However, the decontamination and decommissioning program has not been successful in the maintenance or timely disposition of higher-risk buildings (i.e., buildings that were determined to present the greatest environment, safety, and health risks based on a prioritization process that considered building conditions and the quantities and types of hazardous materials they contain). In other areas of environmental remediation projects, beyond the scope of this review, it was noted that accomplishments have been made (i.e., final cleanup of the waste pond project).

EM and OR management expressed concern with the lack of progress in the decontamination and decommissioning of ETTP facilities when compared to allocated resources in the last four years. Demolition of some contaminated buildings, such as K-1131 (Feed and Tails) and K-725 (Machine Shop), has been repeatedly deferred.

These two buildings were among the five highest risk radiologically contaminated facilities scheduled for demolition as ranked by the ETTP risk ranking system. These two high-risk buildings, originally scheduled for demolition in fiscal year 1997, are again scheduled for decontamination and decommissioning in 1998, but indications are that it will probably not occur unless their disposition is accorded higher priority or additional funding is allocated.

The concern related to the lack of progress toward mitigation and demolition of the highest risk buildings, such as Buildings 725 and 1131, is exacerbated by recent decisions to place higher-risk facilities in an "abandoned-in-place" status to reduce the costs of surveillance and maintenance and control access. Contrary to DOE and site policy, these facilities are not adequately maintained, although they contain significant hazards, such as radioactive contamination, hazardous chemicals, and asbestos, that have not been completely removed or stabilized. Allowing hazardous facilities to deteriorate in an accelerated manner increases the hazards to workers and the environment, as well as the cost, difficulty, and dangers associated with eventual decontamination and decommissioning.

Over the past year, OR, in cooperation with CROET, has signed five leases under the reindustrialization program, and private sector workers are stationed in several ETTP facilities. These initial leases were implemented prior to clearly and completely defining DOE roles, responsibilities, and authorities for safety management and line oversight. Neither the Occupational Safety and Health Administration nor DOE is performing oversight of the private sector activities being performed on DOE property. A year after the first lease, OR is still continuing to address key environment, safety, and health activities needed to protect private sector workers, such as modifying the radiological protection program, identifying and implementing necessary training, and defining services to be shared by DOE and the lessee, such as fire protection and emergency planning.

The addition of reindustrialization as a major element of the ETTP mission has also created an apparent competition for management attention and resources between reindustrialization and other activities related to controlling and reducing site hazards. OR has also leased spaces within a building that has not been fully decontaminated and that still contains potential worker hazards, including radiological contamination, asbestos, and fissile materials. OR managers indicated that funding was not available to support complete decontamination and decommissioning of this building prior to leasing.

Conclusion

The strategy to reindustrialize the site appears to have significant potential benefit to DOE and the community. However, EM and OR need to expedite their efforts to clarify DOE safety responsibilities, authorities, and liabilities with respect to private sector workers at ETTP.

The Office of the Assistant Secretary for Environment, Safety and Health (EH) acknowledges the complexities and difficulty of prioritizing limited resources to effectively disposition the multitude of shutdown facilities across ETTP, the five OR sites, and the DOE complex. EH also recognizes that higher-risk buildings at ETTP must compete for limited resources with other OR priorities, including reindustrialization and regulatory-driven environmental cleanup and restoration activities. However, it is clear that deferring decontamination and decommissioning of facilities scheduled for demolition and allowing them to deteriorate will increase the long-term risks and costs of facility disposition.

EM and OR management need to promptly revisit and coordinate priorities to assure the characterization of facility hazards and the proper upkeep and timely disposition of shutdown facilities in a manner consistent with worker safety and the long-term interests of the Department. This should include immediate identification and communication of DOE roles, responsibilities, authorities, and accountability for the safety of private sector workers and the advisability of and liabilities associated with the leasing of spaces within facilities not completely decontaminated and deactivated. In summary, there needs to be an improved balance achieved in safety management at ETTP regarding the upkeep and disposition of high-risk radiologically contaminated buildings, environmental restoration, and the implementation of the reindustrialization program, including the application of funding, resources, and management focus and priority.

1.0 Introduction

The Office of Environment, Safety and Health reviewed safety management of facility disposition efforts at the East Tennessee Technology Park (ETTP) from May to June 1997.

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health (EH) conducted an independent oversight review of selected elements of safety management at the East Tennessee Technology Park (ETTP) from May to June 1997. The purpose of the review was to determine how effectively DOE and contractor line management have implemented an integrated safety management system and environment, safety, and health (ES&H) programs for the ongoing ETTP facility disposition efforts.

Since the ETTP production mission ended in 1987, ETTP has focused on environmental management.

ETTP, formerly known as the Oak Ridge Gaseous Diffusion Plant and later as the Oak Ridge K-25 Site, was established in 1942 as part of the Manhattan Project to produce enriched uranium. Since the site's production mission ended in 1987, ETTP has focused on environmental management activities–the activities related to cleaning up the site–including maintaining facilities pending decisions about their disposition, characterizing and managing hazardous materials and conditions, and preparing for decontamination and decommissioning and the eventual restoration of the site to unrestricted use.

The ETTP mission is evolving toward "reindustrialization," with emphasis on reuse of ETTP facilities.

The recent (1996) change in the name of the site from the K-25 Site to the East Tennessee Technology Park (ETTP) was symbolic of an evolution in the site mission, which now emphasizes reindustrialization and the reuse of site assets, including the site facilities, equipment, utilities, and workforce. This effort involves leasing facilities for commercial use and developing partnerships with commercial industrial organizations to perform ongoing site environmental management activities.

TERMINOLOGY

Facility disposition includes the spectrum of activities (including shutdown, decontamination, decommissioning, and preparation for reuse) related to ETTP facilities that are no longer needed for their original mission or for ongoing activities in support of DOE (e.g., waste management and research and development).

Safety management refers to those systems required to ensure that an acceptable level of protection of the public, workers, and environment is maintained throughout the life of a facility or operation. The term "safety," when used in the context of safety management, specifically includes all aspects of ES&H.

Line management refers to the chain of command that extends from the Secretary of Energy through the Deputy Secretary or Under Secretary to the cognizant secretarial officer, DOE operations office manager, and contractors. Line management consists of DOE and contractor personnel organizationally or contractually responsible for work or job tasks (see Figures 1 and 2).

Integrated safety management system refers to a comprehensive and coordinated program of ES&H expectations and activities. DOE's recently-issued policy, DOE Policy 450.4, Safety Management System, defines six components of an integrated safety management system: 1) the objective, 2) guiding principles, 3) core functions, 4) mechanisms, 5) responsibilities, and 6) implementation. These components provide the framework for the Office of Oversight's evaluation of the ETTP safety management program.

OVERVIEW OF THE EAST TENNESSEE TECHNOLOGY PARK

MISSION: Reindustrialize and reuse site assets (i.e., facilities, equipment, materials, utilities, and trained workforce) through leasing of vacated facilities and incorporation of commercial industrial organizations as partners in the ongoing environmental restoration, decontamination and decommissioning, waste treatment and disposal, and diffusion technology developmental activities.

HISTORY: The site's original mission was production of highly enriched uranium[1] for nuclear weapons using the gaseous diffusion process[2]. After production of highly enriched uranium for military use was discontinued in 1964, the site continued to produce low-enriched uranium for use in the fuel elements of nuclear reactors and had a significant role in research and development activities related to the gas centrifuge method of uranium enrichment and laser isotope separation. Because of the reduced demand for enriched uranium, the gaseous diffusion operations were placed in standby mode in 1985 and the gas centrifuge program was canceled the same year. In 1987, DOE announced its decision to permanently shut down the gaseous diffusion operations and placed the site on a list of facilities slated for decontamination and decommissioning.

LOCATION: ETTP is located on the Oak Ridge Reservation, which is a Federal reservation owned by DOE. The reservation is sited in eastern Tennessee, between the Cumberland and South Appalachian mountain ranges. The site is about 2 miles from Oak Ridge, Tennessee (population 27,000) and 20 miles from Knoxville, Tennessee (population 165,000).

BUDGET AND STAFFING: The budget for 1997 is $221 million for landlord infrastructure, decontamination and decommissioning, surveillance and maintenance, environmental restoration, and waste management. Currently, about 4,500 LMES employees are working at the ETTP or are providing support to the ETTP activities. LMES is in the process of implementing a recently announced 30 percent reduction in force. There are also five companies that currently have agreements to lease ETTP facilities. Collectively, these companies could have about 75 personnel stationed on site.

ONGOING ACTIVITIES AND MAJOR FACILITIES: Most major ETTP facilities, such as the large buildings used to house the thousands of compressors and pumps, and miles of piping (referred to as the cascades), were designed for use in the uranium enrichment mission. These facilities have been shut down for a number of years, although portions are used for miscellaneous functions such as waste storage. Various laboratories and related facilities are being used for ongoing research and development projects in the area of environmental technology or for analytical support (e.g., analyzing samples for monitoring and surveillance). ETTP also has an extensive waste management program; personnel stationed at ETTP support the waste management and cleanup at other OR facilities as well as ETTP. ETTP operates the Toxic Substances Control Act Incinerator, which is licensed to burn both solid and liquid mixed wastes. The commercial companies use the ETTP facilities for a variety of efforts, such as manufacturing waste disposal containers.

[1] Uranium has several isotopes (i.e., atoms with the same number of protons but a different number of neutrons), the most common of which are U-238 and U-235. Natural uranium consists of over 99 percent U-238 and about 0.7 percent U-235. The U-235 isotope is capable of supporting the chain reaction phenomenon that is the basis for nuclear weapons and reactors (i.e., U-235 is fissile), while the U-238 isotope will not support a chain reaction. The fraction of U-235 must be increased from its natural level for use in the nuclear weapons program; increasing the fraction of U-235 is referred to as "enrichment." Similarly, nuclear reactors used in the nuclear navy, most research reactors, and most commercial power reactors use enriched uranium as the reactor fuel; commercial power reactors typically use uranium that has been enriched to between 3 and 6 percent U-235.

[2] Because the isotopes of uranium are chemically identical, they cannot be separated by chemical processes. A number of different types of processes have been developed for enriching uranium, all of which capitalize on the small difference in the atomic weights of the isotopes. These processes require extensive equipment and large amounts of electric power to produce significant quantities of enriched uranium. In the U.S., the vast majority of enriched uranium has been produced using the gaseous diffusion process. The gas centrifuge process and laser isotope separation process are other approaches that have been developed on a laboratory scale but not implemented on a production scale in the U.S.

ETTP line management includes the DOE Office of Environmental Management (EM), the Oak Ridge Operations Office (OR), and Lockheed-Martin Energy Systems (LMES).

The Office of Environmental Management (EM) is the DOE Headquarters office responsible for ETTP. DOE's Oak Ridge Operations Office (OR) is the DOE field element with responsibility for ETTP operations. The current managing and operating contractor is Lockheed-Martin Energy Systems (LMES). Various divisions of Lockheed-Martin, the parent organization of LMES, also manage and operate other major sites in the OR complex (the Y-12 Plant and the Oak Ridge National Laboratory in Oak Ridge, Tennessee) and the two active diffusion plants in the United States–Portsmouth Gaseous Diffusion Plant in Piketon, Ohio, and the Paducah Gaseous Diffusion Plant in Paducah, Kentucky–under contract to the privatized United States Enrichment Corporation. NOTE: When the term "ETTP line management" is used in this report, it refers to the collective line management chain from EM to OR to the contractor.

Figure 1 shows a simplified view of the DOE and contractor organizations that have key roles in managing activities at ETTP. Figure 2 shows a simplified version of the organizational structures of OR and LMES.

The current management and operating contract with LMES expires in April 1998. For the ongoing procurement effort for the next contract, DOE has chosen to implement the integrating contractor concept. In this approach, the new integrating contractor (LMES reports that they are not bidding for the integrating contractor position) will manage the work of multiple subcontractors. The integrating contractor and its subcontractors will be responsible for performing ongoing site activities, such as waste management, most decontamination and decommissioning efforts, ES&H support services (e.g., radiological control), utilities, and plant security. Each defined area of work will be performed according to a separate contract, so that OR and the new integrating contractor may be managing the efforts of a large number of different subcontractors.

Scope

The review of ETTP focused on the effectiveness of EM, OR, LMES, and selected LMES subcontractors in implementing safety management principles for the facility disposition effort. The facility disposition effort encompasses the activities related to surplus facilities from the point at which a determination is made that they are no longer needed by DOE until they are either demolished or cleaned sufficiently that they can be released for use. This effort encompasses:

- Surveillance and maintenance–Monitoring facility conditions and performing needed upkeep to ensure that remaining hazardous materials are controlled until they can be removed and that the building is maintained in a safe condition.

- Deactivation–The removal or stabilization of hazardous conditions and materials to reduce potential hazards and reduce surveillance and maintenance costs.

- Decontamination and decommissioning activities–Removal of hazardous materials and contamination to below specified levels, removal of equipment and interior structures, and, in some cases, demolition of structures.

The facility disposition effort is a prerequisite to the eventual goal of restoring the site for unrestricted use–usually referred to as environmental restoration–which may also involve cleaning up the site soil and water so that residual levels of contamination are below specified limits.

Facilities at various stages of disposition were reviewed.

The EH Office of Oversight team examined the application of safety management at shutdown facilities, decontamination and decommissioning projects, and leased facilities. Within each of these three categories, Oversight selected specific facilities to

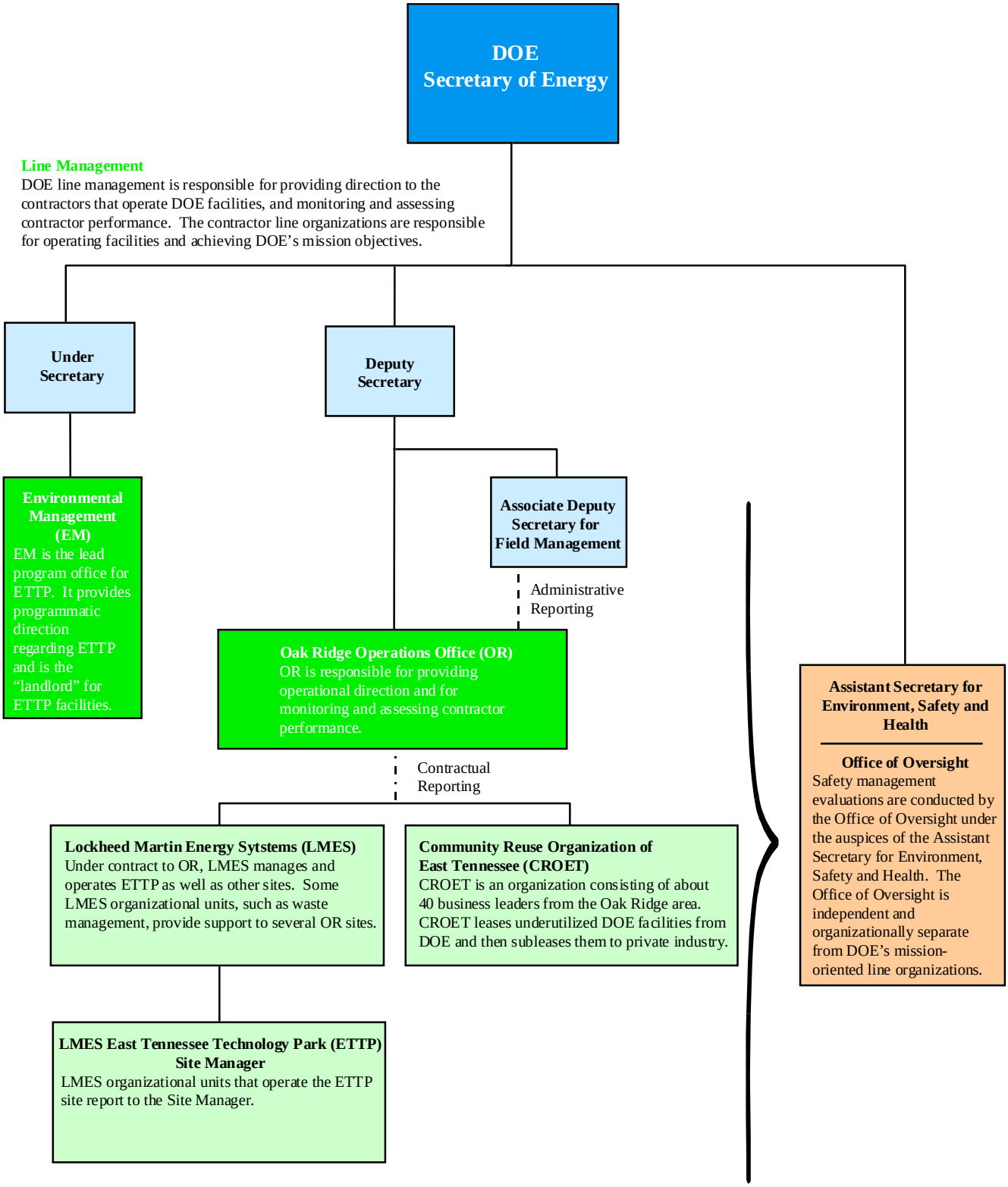


Figure 1. Organizations with Responsibilities at East Tennessee Technology Park

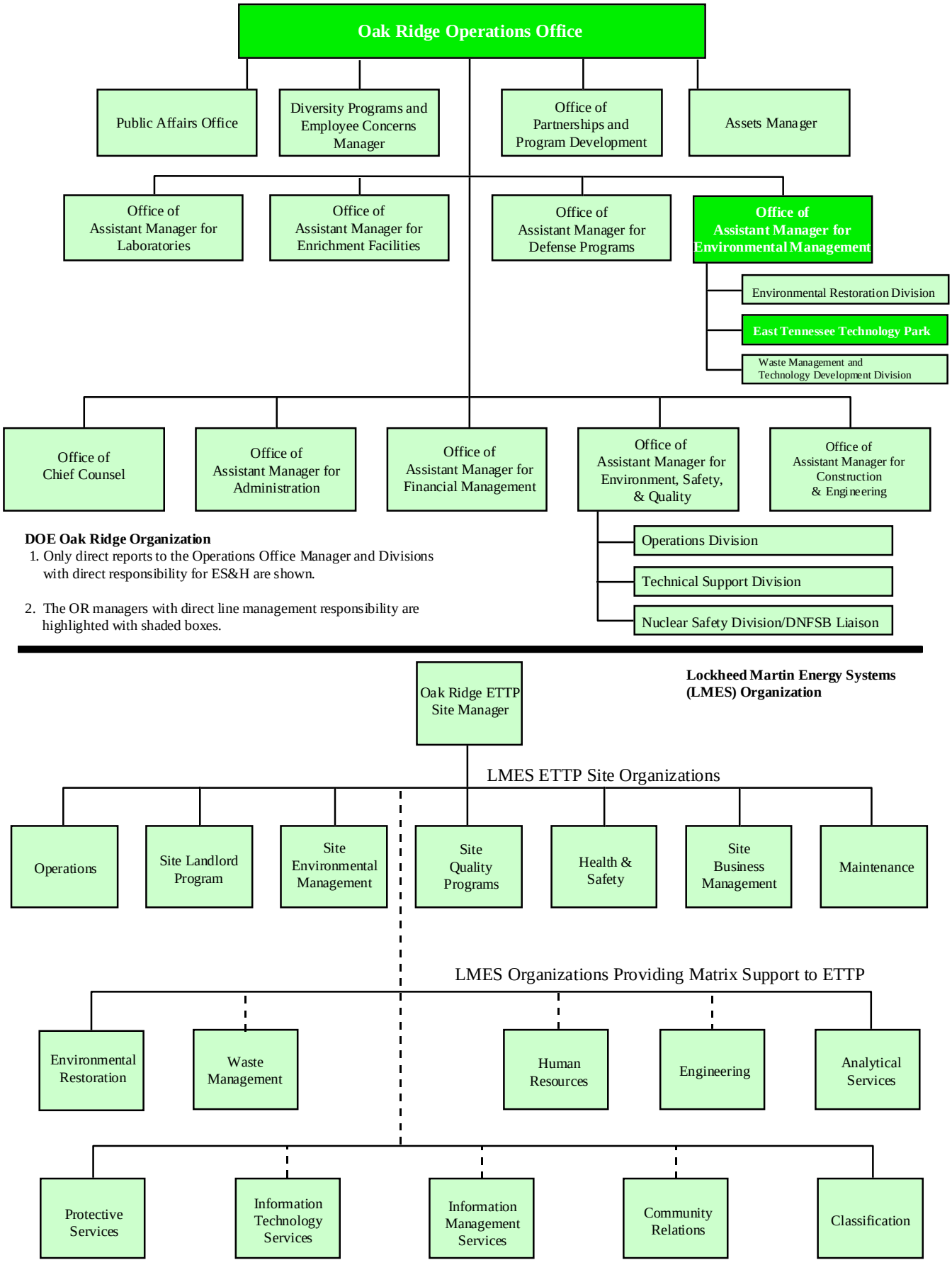


Figure 2. DOE Oak Ridge and East Tennessee Technology Park Organizations

review in depth. At these facilities, the Oversight team examined selected ES&H topics, including radiological protection, industrial safety/hygiene, construction safety, and maintenance. The characteristics and potential hazards for the facilities selected are shown in Table 1.

Corrective action and lessons learned programs were also reviewed.

The Oversight team also reviewed the OR and LMES corrective action and lessons learned programs. The emphasis was on recent OR and LMES efforts to correct systemic weaknesses in implementing corrective actions and lessons learned programs that were evident in previous assessments and accident investigations at ETTP.

TABLE 1. POTENTIAL HAZARDS AT FACILITIES REVIEWED

Facility	Characteristics and Activities	Hazardous Materials and Conditions
Shutdown Facilities		
K-725, Machine Shop	Shutdown and abandoned in place – access to the building is prohibited. Upon initial shutdown and again in the 1970s, ETTP attempted to decontaminate the building and seal ventilation ducts containing beryllium; these attempts were unsuccessful.	Beryllium contamination and mercury in floor drains. Radioactive contamination. Degraded building structures, including a leaking roof, crumbling walls, and missing windows. Conditions (beryllium contamination and degraded structures) are such that access to the building is prohibited in essentially all circumstances (including surveillance, maintenance, and assessments).
K-1131, Feed and Tails Building	Approximately 50,000 square feet of floor space. Shutdown and abandoned in place – only normal activity is the annual surveillance and occasional entries.	Radioactive contamination. Residual fluorides and lube oil, asbestos, oils, volatile organic compounds, selenium, nickel, and cadmium in electrical components. Degrading building structures. Leaking roof accelerating building degradation and exposing materials to rain and temperature variations. UF_6 cylinders in areas where they are exposed to environmental conditions.
K-1420, Decontamination Building	Approximately 80,000 square feet of floor space. In shutdown status – only activities are limited surveillance and maintenance. Request for proposal issued for cleanup and deactivation.	Special nuclear material; radioactive, hazardous, and mixed wastes. Radioactive contamination. Chemical deposits in equipment (e.g., nickel sulfate). Potential environmental releases to adjacent stream.
Decontamination and Decommissioning Projects		
K-29, Diffusion Cascade	One of the five "cascade" buildings at ETTP. Two story building with over 580,000 square feet of floor space. Encompasses hundreds of compressors and pumps and miles of piping, and extensive support equipment. Shutdown since the mid-1980s and preparing to undergo decontamination and decommissioning. Used for low-level radioactive and hazardous waste storage.	Potential for nuclear criticality. Radioactive contamination. Storage of low-level radioactive waste in liquid, solid, and sludge forms. Uranium deposits in process piping and equipment. Hazardous chemicals and materials, including hydrogen fluoride, asbestos insulation, oils, and polychlorinated biphenyls (PCBs). High voltage electrical equipment. Hazardous demolition and disassembly activities (cutting, falls, welding).
Leased Facilities		
K-1420, Maintenance Building	Formerly used for maintenance activities. Shutdown with limited surveillance and maintenance. Approximately 400,000 square feet of floor space and large amounts of machine tools and equipment. Currently used by ETTP and commercial companies for various activities. Various materials stored in basement.	Radioactive contamination. Loose and degrading asbestos. Water leaks potentially transporting radioactive contamination and asbestos under barriers. Ventilation air flow over contaminated canals and groundwater. Hazardous chemicals, including pesticides, and herbicide storage.

2.0 Results

Until recently, the primary ETTP mission was environmental management, with a focus on decontamination and decommissioning of ETTP facilities and environmental restoration of the site. Over the past two years, the mission of ETTP has been expanded to include a focus on reindustrialization and the reuse of site assets, including facilities, equipment, utilities, and workforce.

DOE plans to use a number of innovative methods to reduce the costs of site cleanup.

Under its reindustrialization initiative, DOE intends to partner with commercial industrial organizations and the community to clean up and reuse the site for commercial enterprises. OR stated that their intent is to use a number of innovative methods to accomplish the ETTP cleanup at a reduced cost and to restore the site for commercial use. The OR Manager has described this innovative approach to cleanup as follows: "There would not be enough money in the budget to address all the cleanup issues using traditional means. We are trying to resolve those issues in part by bringing private industry to invest in and develop innovative cleanup strategies. In return, we will make buildings and equipment available to them."

Although environmental management is still an important aspect of the ETTP mission, the emphasis on reindustrialization signifies an important shift in priorities. As discussed throughout this section, the reindustrialization has resulted in a significantly different approach to accomplishing the environmental management activities for buildings targeted for reuse, and has been an important factor in other recent ETTP efforts, including the prioritization of decontamination and decommissioning efforts and the efforts to reduce the cost of maintaining surplus facilities, referred to as the "abandon-in-place" approach.

Safety Management of Shutdown Facilities

With the end of its production mission and major research programs, most of the ETTP facilities have been shut down and will eventually be subject to decontamination and decommissioning. Over 130 ETTP facilities[1] contain "legacy" hazards from years of operations involving uranium, beryllium, asbestos, mercury, polychlorinated biphenyls (PCBs), and other hazardous chemicals. Completion of the decontamination and decommissioning effort is planned to take about ten years. Until then, ETTP is required to ensure that its facilities are maintained in a condition that ensures protection of the workers, the public, and the environment, and that facilitates eventual decontamination and decommissioning.

To maintain its facilities, LMES has a surveillance and maintenance program that is responsible for conducting periodic reviews of facility conditions, maintaining the structures and equipment as appropriate.

Many ETTP facilities have been "abandoned-in-place" to reduce maintenance costs.

In the past two years, ETTP has implemented the abandon-in-place approach, which OR and LMES managers indicated was implemented to reduce surveillance and maintenance costs and

[1] The term "facility" as used in these numbers does not necessarily represent a building; it can also refer to other structures or equipment such as steam lines or tanks.

limit access. ETTP policies and documents state that certain actions (such as removal of hazardous materials) must be accomplished to "achieve a safe, stable, and environmentally sound condition, suitable for an extended period, as quickly and economically as possible." In addition, the site documents state that "the facility is to be kept in a stable condition by means of methodical surveillance and maintenance, pending ultimate disposal." According to the ETTP concept, surveillance and maintenance costs for abandon-in-place facilities would be lower because most of the hazards would be removed or stabilized and equipment that requires maintenance (e.g., heating and air conditioning and radiation monitors) would be removed. Of the more than 130 ETTP facilities that are contaminated or contain hazardous materials, 82 have been placed in the abandon-in-place category (43 of these 82 are buildings; the others are various structures or equipment).

The facilities reviewed were among the highest priority buildings scheduled for demolition.

The review of shutdown facilities focused on the ETTP surveillance and maintenance program at five of 130 buildings in that program. The buildings selected were: Building K-1131, Feed and Tails; Building K-725, Machine Shop; and Building K-1420, Decontamination. Two of these facilities, K-1131 and K-725, are categorized as abandon-in-place. ETTP management views the third facility, K-1420, as a potential candidate for future reuse under the reindustrialization effort.

Facility Conditions

Building K-1131. Building K-1131 still contains various hazards, including uranium deposits, UF_6 cylinders, asbestos, lead-based paint, chemical residues, and high levels of radiological contamination. Essentially all maintenance has been discontinued. Normal building services (electrical power; heating, ventilation, and air conditioning; automatic fire protection; and exit lighting) have all been taken out of service, and routine radiation and air monitoring sampling is no longer conducted. Because of rapidly deteriorating conditions, a respirator is required for entry to this facility. Such measures were not required until recent months.

The conditions at K-1131—a former process facility–are not conducive to safety and are deteriorating rapidly.

The current conditions in K-1131 are not conducive to safety and are deteriorating rapidly, as demonstrated by the photographs taken in conjunction with a tour by review team personnel, shown on the next page. The roof is leaking severely and its structural integrity is degraded, resulting in ceiling panels and other debris falling from the ceiling. On the day of the Oversight tour, rainwater showered down into large areas of the facility, contributing to significant amounts of standing water. Radioactive contamination, asbestos, lead-based paint, and lubrication oil have washed down and accumulated on the floor in standing water due to the intentionally plugged floor drains. A stairway was indicated by escorts to be unsafe but lacked barriers or warning signs. Chemical tanks in this building were believed to be empty but were not labeled "empty" as required. Various penetrations in the outer walls are potential release paths.

The contaminated water poses a potential threat to groundwater from water pathways (e.g., leaks out uncontrolled penetrations in buildings). In addition, rapidly degrading building structures increase worker safety hazards (e.g., slippery conditions, falling roof panels, structurally-degrading stairways, radiological contamination, and loose asbestos) for personnel who enter the facility, even with proper protective clothing.

As indicated in the chronology of events (see text box) and ETTP documentation, management has been aware of these buildings' degrading conditions for some time. For example, a 1994 LMES "Master Plan" stated that asbestos insulation is deteriorating faster than expected because rainwater leaks onto insulation from leaking roofs or wall membranes, and because of cold conditions in the unheated building. Requests for funding to repair and maintain the building roof have not been granted for several years, based on the intent to demolish the facility.

Longstanding facility degradation has been accelerated since the process facility was placed in abandon-in-place status, and maintenance stopped.

The decisions to not perform roof maintenance and upgrades, and subsequent decisions to place K-1131

Facility Conditions in June 1997

Facility Conditions in 1994

Chronology of Building K-1131, Feed and Tails Building

K-1131 was buldt in 1945 as a dry-air plant in support of the K-25 enrichment cascade.

- **1945** K-1131 was built as a maintenance facility in support of the K-25 enrichment cascade.
- **1951** The building was converted and operated as a UF_6 production facility.
- **1962** The building was converted and operated as a UF_6 feed vaporization and depleted UF_6 tails withdrawal facility.
- **1979** The roof was refurbished.
- **1985** K-1131 was shut down. The process equipment and distribution system was evacuated, purged, and isolated. Some deposits of residual uranium materials remain in the system. Minimal maintenance is performed on the building to maintain its shutdown condition.
- **1992** Six out of 13 identified roof leaks are repaired as reported in the Surveillance and Maintenance Annual Report for 1992. This is the last time roof repair work was performed on K-1131.
- **1994** The roof deteriorated to the point that it needed to be replaced. An installation specification was issued. The interior of the building had noticeably degraded due to the leaking roof.
- **1995** A roof replacement proposal for $315K was disapproved because of anticipated decontamination and decommissioning.
- **1996** The building status was changed to “Abandoned-in-Place” (AIP). According to the policy for AIP, a building must be safe, stable, and environmentally sound before becoming AIP. No corrective actions were performed to repair the roof or remove hazardous material to satisfy site requirements for AIP buildings.
- **1996** K-1131 was not included in an assessment of the conditions of the roofs of some shutdown buildings because it was a candidate for decontamination and decommissioning and K-1131 has no role in reindustrialization.
- **1996** A proposal to install a dike in K-1131 to prevent the release of rain water to the environment at a cost of $100K was not implemented.
- **1996** DOE disapproved funding to start decontamination and decommissioning of K-1131.
- **1997** Over half of the roof has failed. Much of the facility is exposed directly to rain water. Entry into the facility requires a respirator for asbestos protection and two sets of anti-contamination clothing for contamination protection. The cost to replace the roof in K-1131 is estimated at $1.4 million.

1997 DOE approves an Action Memorandum that commits DOE to dismantle K-1131 and four other facilities by the year 2000 with a cost estimate of $19M. It is noted in the Action Memorandum that delays will permit the buildings to further deteriorate, making it more complex to perform waste separation, transportation, and disposal, and increasing the likelihood of contaminants being released into the environment fro the movement of rain water.

in abandon-in-place status (without completely stabilizing the facility) have significantly accelerated degradation of this facility over the past three years. The degradation is evident in comparing photographs taken three years ago with those taken during the Oversight review.

A former machine shop contaminated with beryllium is in an advanced state of degradation.

Building K-725. Conditions in Building K-725, which has been shut down and essentially abandoned for nearly 40 years, are reported to be even worse than K-1131. K-725 was a machine shop that still has beryllium deposits in the ventilation ducts. The building is in an advanced state of degradation (see photos). The walls are crumbling, a tree is growing

Conditions at Building K-725 in June 1997

between the building wall and a ventilation duct, weeds and vines are growing over the structures, windows are gone, the roof is degraded, and the entire area is roped off and fenced as radiologically contaminated. Conditions are such that access to this facility has been prohibited for any reason (including annual surveillance). With beryllium in the duct work, mercury, radiological and asbestos contamination, and a significantly degraded structural condition, this building represents a substantial challenge to eventual decontamination and decommissioning efforts and environmental restoration.

Building K-1420. Conditions in Building K-1420 are significantly better than in the other facilities

Conditions at Building K-725 in June 1997

reviewed. This facility, once used for decontamination of equipment, has not been placed in abandon-in-place status, and some surveillance and maintenance activities are performed. However, OR and LMES management decided to limit roof maintenance and degradation of the facility from leaking roofs has been noted since 1994, although it is not as advanced as the degradation in K-1131. Decontamination and decommissioning of the building is scheduled for 1998.

Hazardous Conditions Increase Rapidly at Buildings with Inadequate Surveillance and Maintenance Programs

DOE policies and guidance recognize that hazards and ultimate cleanup costs can increase if shutdown facilities are not adequately maintained. DOE orders and guidance require that shutdown facilities be subject to adequate surveillance and maintenance to preserve DOE assets; assure public, worker, and environmental protection; and facilitate final disposition or decontamination and decommissioning. Further, a 1993 General Accounting Office (GAO) report on cleanup of inactive facilities, which included the Oak Ridge site, was very critical of the approaches that involved abandoning aging and hazardous facilities. The GAO report concluded that **"the Department is beginning to realize that: 1) inactive facilities can present real dangers to workers in and around them, and 2) the way it closes and maintains inactive facilities will influence the cost and dangers of cleaning them up."** In the three years since this report was issued, DOE

has not taken action to prevent rapid deterioration at some ETTP buildings.

Increasing hazards are evident in shutdown facilities.

This Oversight review of selected shutdown facilities indicates that deterioration of shutdown buildings such as K-1131 is resulting in increasingly hazardous conditions and will increase the costs and hazards of future decontamination and decommissioning efforts. The condition of some ETTP facilities demonstrates that past and present surveillance and maintenance programs have not been sufficient to prevent excessive and unnecessary deterioration.

In general, ETTP surveillance and maintenance program activities are inconsistently implemented and lack formality and rigor. The maintenance of roofs for higher-risk buildings has not been prioritized, funded, or implemented, contributing to accelerated deterioration of facilities that contain hazardous materials and conditions. The surveillance and maintenance program does not provide an effective mechanism for recording information about the status of activities and conditions. This is particularly important considering the substantial changes in personnel as the new site contractors are selected and staffed.

In addition, OR and LMES have not implemented an effective process to ensure that the authorization basis (i.e., the facility-specific parameters that are established to ensure that activities can be conducted safely) is maintained current to reflect changing facility life-cycle phases, degrading physical conditions, or changing uses and hazards. While LMES has initiated a facility verification and auditable safety analysis (ASA) inspection program for these facilities, it was found that the reported information of poor condition had not been analyzed. For example, the current conditions of K-1131 (e.g., abandoned in place with little maintenance, significantly degraded roof, and the washdown of asbestos and lead-based paint into standing water on the floor) have not been adequately analyzed. However, the ASA does not analyze future life cycle considerations, such as structural issues resulting from expected gradual degradation of the facility and its implications. Shutdown facilities that undergo significant changes in configuration or physical condition should be analyzed to ensure that changing conditions do not result in unsafe conditions.

The ETTP approach to abandon-in-place does not meet DOE or LMES guidance or provide for a controlled deactivation.

The LMES documents that describe the abandon-in-place approach include provisions (such as removal or stabilization of hazards) that are similar to deactivation, which is a recognized life cycle phase in DOE designed to reduce surveillance and maintenance costs. Deactivation involves removing hazards, placing the facility in a safe and stable condition, defining "end point" criteria (the facility conditions to be achieved), and providing adequate upkeep to preserve the facility for decontamination and decommissioning. Although the LMES requirements for abandon-in-place are similar to DOE requirements for deactivation, the abandon-in-place approach has not been implemented in accordance with the LMES-specified provisions and, in practice, has not been implemented in accordance with DOE's criteria for deactivation. Most notably, hazardous materials were not stabilized, and in some cases, materials (including UF_6 cylinders) were inappropriately left in abandon-in-place buildings where they are exposed to moisture and environmental conditions. In some cases, the abandon-in-place approach has involved little except restricting normal access to the facility (i.e., "locking the door") and discontinuing most surveillance and maintenance activities.

Current risks to workers at shutdown facilities are limited because access to the buildings is limited.

Overall risks to workers are currently limited at buildings that have been placed in abandon-in-place status, primarily because very few workers enter these buildings. However, occasional access still occurs (except at Building K-725) for surveillance and material inventories. In addition, there are few measures to prevent unauthorized or inadvertent access to shutdown facilities. Further, LMES has not been timely in implementing additional controls as changing

hazards are noted. For example, four weeks following the determination by the LMES industrial hygiene group that Building K-1131 required respirators as a result of degraded asbestos conditions, the facility access data base had not been updated to reflect the change in required personal protective equipment, and the building was not posted as a regulated area.

The implementation of the abandon-in-place concept has not been well planned.

The implementation of the abandon-in-place concept was not effectively coordinated or well planned. ETTP line management did not establish clear criteria to ensure that only appropriate facilities were selected, did not establish formal processes to ensure implementation consistent with DOE and LMES policy, and did not ensure that ES&H specialists had sufficient involvement in the selection process and the subsequent controls. Despite being among the top five risk-ranked radiologically contaminated buildings for decommissioning and demolition (risk-ranking is discussed further in the next subsection), Buildings K-1131 and K-725 have recently been categorized as abandon-in-place. At these facilities and others included in the ETTP abandon-in-place program, hazardous materials have not been removed, and conditions have not been completely stabilized; therefore, they were not suitable for an abandon-in-place approach. If it must be used, the abandon-in-place concept is a viable option for non-hazardous facilities that can be fenced off until final dismantlement, such as office buildings, warehouses, and smoke stacks. This type of facility could essentially be demolished with a wrecking ball, and it would not be necessary for personnel to enter to remove nuclear, radiological, or chemical hazards.

A more systematic process is needed to safely manage shutdown facilities and protect long-term interests.

EH recognizes the complexities and difficulty of prioritizing limited resources to effectively disposition the multitude of shutdown facilities across ETTP, as well as the fact that higher-risk buildings at ETTP must compete for limited resources with other priorities, including reindustrialization and regulatory-driven environmental cleanup and restoration activities. Further, OR must consider competing priorities at its other sites, and EM needs to consider priorities across the DOE complex. Although effective prioritization is challenging, it is clear that allowing higher-risk buildings to deteriorate will increase the long-term risks and costs of facility disposition.

Decontamination and Decommissioning Program

Status of Decontamination and Decommissioning Efforts

As one of the first DOE sites to be shut down, ETTP has had a decontamination and decommissioning program in place for a number of years. The initial strategy was to "contain" hazardous material while risks were characterized and remediation options selected.

ETTP has developed a rigorous risk-based prioritization system.

Over the past few years, OR and LMES have established and implemented a systematic, risk-based prioritization system that has a rigorous technical basis and includes stakeholder participation. The prioritization system is designed to identify high-risk buildings awaiting disposition and to determine priorities and allocate resources. The system considers a variety of risk-based factors, including regulatory compliance, worker safety, environmental impact, and public safety. The identified higher-risk facilities were divided into four groups. Five radiologically contaminated buildings were placed in Group I, and were slated to be the first to undergo decommissioning and demolition.

These initial groupings were then subject to additional ranking and project sequencing based on factors such as the potential to reduce future costs, potential for reindustrialization, and competing needs for other decontamination, decommissioning, and environmental cleanup activities at ETTP and other OR sites. As a result, higher-risk buildings, according to the pure risk-based factors, are ranked lower in the overall OR and site priorities.

Given the large number of facilities awaiting decontamination and decommissioning, the complex and varied hazards, and the available funding for

ETTP SITE CLEANUP ACCOMPLISHMENTS 1994-1996

1994

Prepared and placed 123 large electrical power transformers into storage to meet the Federal Facility Compliance Agreement milestone for polychlorinated biphenyls (PCBs).

1995

Removed six cooling tower structures by conventional demolition techniques.

Demolished site powerhouse buildings and disposed of scrap.

Completed removal of bulk lubricating oil (~300,000 gallons) from process buildings.

Completed roof decking structural assessments of surveillance and maintenance facilities with potential for reuse.

1996

Installed a new 17-acre roof on Building K-31 to bring it into compliance with existing permits for Resource Conservation and Recovery Act (RCRA) storage areas.

Initiated small-scale metal recycle project to demonstrate capability to recover contaminated metals and equipment from gaseous diffusion facilities.

Stabilized Building K-1303 by removal of ~19,000 pounds of clean scrap metal and 3,000 pounds of debris, and deactivation of power, utilities, and systems.

Completed coolant removal project, shipping 393,163 lb of coolant off site.

Placed 13 percent of decontamination and decommissioning floor space (~1.5 million square feet) in abandon-in-place status.

decontamination and decommissioning, this LMES characterization and prioritization effort was an essential step. Until recently, however, the site has not been effective in moving beyond the planning and prioritization steps for buildings scheduled for demolition.

ETTP has successfully decommissioned two major structures using a fixed-price contract approach.

Two site structures, the power plant (see photos) and a set of six cooling towers, which were determined to be fire risks, have been successfully demolished in the past year. Although the demolition efforts were contracted out, OR and LMES managers indicated that decommissioning the power plant first helped them to gain needed experience with a decontamination and decommissioning effort performed under a fixed price contract prior to attempting higher-risk buildings. These structures and their auxiliary facilities were demolished under a contracting method referred to as an Incentive Task Order. Under this approach, OR has teamed with the contractor on ES&H issues during the early stages of projects to develop clear safety and health requirements. Combined with frequent OR line management oversight, the clear definition of requirements contributed to completion of the power plant demolition project on time and under budget with no reportable injuries or illnesses.

Progress in decontaminating and decommissioning higher-risk facilities has been very limited.

Although some recent progress has been made on facilities such as the power plant and cooling towers, ETTP has made little progress toward reducing hazards at the higher-risk contaminated buildings through decontamination and decommissioning. Over the last four years, approximately $360 million has been

Power Plant Site Before Demolition

directed to support decontamination and decommissioning, environmental compliance, and remedial actions at the ETTP site (demolition of the power plant and cooling towers accounted for approximately $41 million). During this time, none of the five highest-risk buildings slated for demolition has actually entered active decontamination and decommissioning. The total cost for the demolition of all five Group I facilities, based on the Ten Year Plan, is estimated at less than $19 million. Decontamination and decommissioning schedules for these buildings have been set but not implemented; in some cases, surveillance and maintenance were deferred because the buildings were scheduled for decontamination and decommissioning that was subsequently also delayed or deferred.

Current efforts and near-term plans do not address the highest-priority facilities.

In the past year, EM has developed an accelerated schedule for the ETTP decontamination and decommissioning and environmental restoration effort. According to this accelerated schedule, it will take about ten years to complete this effort. However, the current plans for the ETTP decontamination and decommissioning program are not projecting significant near-term progress in reducing many significant site hazards and risks. Despite being among the five highest priority facilities, funding for decontamination and decommissioning of K-1131 and K-725 was not approved in 1996. Although decontamination and decommissioning plans and engineering studies have been completed and approved by the State of Tennessee, no physical decontamination and decommissioning activities have been initiated. Current plans call for decontamination and decommissioning for K-1131 and K-725 to begin in 1998. However, DOE managers indicated that, in the absence of a higher assigned priority or additional funding from EM, decontamination of these buildings will probably not begin in 1998.

Deteriorating conditions will increase decontamination and decommissioning hazards and costs.

The failure of the decontamination and decommissioning program to accomplish the timely disposition of higher-risk ETTP buildings, when combined with inadequate surveillance and maintenance, will result in increasingly hazardous conditions for workers performing decontamination and decommissioning when such activities are conducted in the future. It is also likely that the costs of decontamination and decommissioning activities will increase significantly because of the wider spread of contamination, the difficulties associated with working in structurally unsound buildings, and greater difficulty in characterizing hazards so that work can be effectively planned and implemented.

The buildings definitely scheduled for decontamination and decommissioning are the three main gaseous diffusion cascade buildings (i.e., K-29, K-31, and K-33). As part of the reindustrialization

Power Plant Site After Demolition

effort, there are plans to lease these buildings once they are cleaned up. The contractor for this effort has been selected (British Nuclear Fuels, Limited, or BNFL),and contract negotiations are ongoing. BNFL proposes to remove radioactive contaminants to allow commercial leasing of the buildings and to recycle nickel and other useful metals from the process equipment. Although there are significant challenges associated with the ultimate disposition of the equipment and materials in these facilities, the three cascade buildings are in reasonably good physical condition and are not deteriorating as fast as other facilities at ETTP.

DOE Management of the Decontamination and Decommissioning Program

EM has established a well-defined process to transition surplus facilities through the stages of decontamination and decommissioning and final cleanup. EM-60 directs and funds the removal of hazards and the performance of surveillance and maintenance necessary to ensure that the facilities are safe and suitable for decontamination and decommissioning. The Office of Environmental Restoration (EM-40) accepts transfer of facilities from the Office of Nuclear Material and Facility Stabilization (formerly the Office of Facility Transition and Management) (EM-60) only after the facility meets strict criteria that include removal of fissile and hazardous materials and ensuring the physical integrity of the structures.

EM management has placed ETTP facilities in the decontamination and decommissioning program without ensuring that hazardous materials are removed and facility conditions are stabilized.

However, EM-60 and the EM process for transition of facilities had not been established at the time most ETTP facilities were shut down. These facilities have been the responsibility of EM-40 since they were shut down, and internally EM-40 has not established the same rigorous deactivation criteria or discrete phases for transitioning facilities into the decontamination and decommissioning program. As a result, ETTP facilities that still contain fissile materials or hazardous chemicals and materials and that are in poor and degrading physical condition were placed into the decontamination and decommissioning program. Without essential surveillance and maintenance, including upkeep and roof repair, these facilities can continue to degrade for years while they are awaiting decontamination and decommissioning.

Increased responsibility and authority for decontamination and decommissioning program direction has been delegated to OR over the past few years. In 1995, EM conducted a cost review assessment[2] at ETTP with the objective of reducing surveillance and maintenance to free up funds to make more progress toward the completion of actual decontamination and decommissioning. One of the conclusions of the EM assessment was that "a fundamental change of mind-set is needed to clean areas and accomplish more real decontamination and decommissioning work." OR did not prepare a formal response to the EM-40 assessment, EM did not conduct followup activities, and the referenced "change of mind-set" is not evident at ETTP.

In some cases, ineffective coordination between EM and OR has contributed to delays in projects that are important to decontamination and decommissioning efforts. For example, the Defense Nuclear Facilities Safety Board (DNFSB) issued Recommendation 94-1, "Improved Schedule for Remediation in Defense Nuclear Facilities Complex," to DOE. To address concerns about the potential for a nuclear criticality associated with this recommendation, OR proposed a uranium deposit removal project at the gaseous diffusion plants. Timely removal of these uranium deposits is essential to reducing nuclear criticality hazards. It is also a prerequisite to the decontamination and decommissioning of these buildings. This project has been subject to an 18-month delay; OR attributes the delay to a Headquarters decision to perform a facility operational readiness review in accordance with DOE Order 5480.31, Startup and Restart of Nuclear Facilities. In an effort to meet the revised schedule committed to the DNFSB, OR has appointed a new project team. Appropriate safety documentation associated with planning for the deposit removal, such as the health and safety plan, has been developed but the project is still not under way.

Overall, the EM and OR decontamination and decommissioning program has not been effective in reducing hazards at or cleaning up the highest-risk and radiologically contaminated buildings at ETTP. OR

[2] K-25 U.S. Department of Energy, Oak Ridge Reservation, Decontamination and Decommissioning Surveillance and Maintenance ADS 4701 Cost Review Report, March 1995.

management expressed concern with the lack of effective progress in the decontamination and decommissioning of ETTP facilities relative to the allocated funding in the last four years. DOE and LMES managers interviewed identified a wide range of reasons for the delay in disposition of higher-risk buildings and lack of progress in decontamination and decommissioning of site facilities:

- Excessive study and planning versus implementation
- A lack of contractor decontamination and decommissioning experience
- Uncertainty whether to ship waste generated by decontamination and decommissioning or store it on site
- Higher priority of regulatory-driven environmental cleanup and restoration efforts.
- Funding reductions
- Stovepiping of available funding to specific projects
- The need to develop experience with decontamination and decommissioning of lower-hazard facilities before attempting decontamination and decommissioning of more hazardous facilities (actual decontamination and decommissioning efforts were performed under fixed-price contracts to other companies)
- Priority given to the power plant
- The desire to change the site "footprint" and demonstrate progress to the public quickly by demolishing large prominent structures, such as the power plant and cooling towers.

Although some of the items cited by OR and LMES have merit, it is evident that risk-based priorities are not the primary driving factor in resource allocation decisions. Little or no progress toward decontamination and decommissioning has been made at the higher-risk buildings.

About 50 percent of landlord funding has shifted to reindustrialization.

The recent emphasis on reindustrialization in the site mission and the accompanying competition for limited resources and funding are further exacerbating this problem. OR managers indicate that approximately 50 percent of landlord funding[3] has now shifted to reindustrialization and the upgrade or upkeep of facilities with reuse or leasing potential. As an example, roofing maintenance has been scheduled for lower-risk buildings such as K-1401 and K-1007 that have significant reuse potential, while the roof on K-1131 continues to significantly degrade and increase risks to workers and the environment. The estimated cost for repair of the K-1131 roof has increased 400 percent, from $315 thousand in 1995 to $1.4 million in 1997, due to structural damage from water. The cost for maintaining the extensive building roof areas at ETTP probably exceeds available funding for upkeep. However, maintenance of roofs on higher-risk buildings awaiting demolition that still contain hazards needs to be given priority.

Reindustrialization

ETTP Reindustrialization Initiative

As discussed previously, the ETTP reindustrialization initiative is intended to accomplish the site cleanup effort at reduced cost and restore the site for commercial use through innovative methods and partnerships with industry. There appears to be a high level of enthusiasm for this reindustrialization approach within OR senior management, CROET, and local business leaders. Some of the important features of the reindustrialization approach are:

- DOE will lease facilities to commercial enterprises. The goal is to have the lessees contributing to the cleanup and decontamination and decommissioning of facilities in return for use of ETTP facilities, equipment, and utilities.

- To implement the leasing approach, legislation was passed allowing DOE to participate in the establishment of the Community Reuse Organization of East Tennessee (CROET), which is composed of about 40 local community leaders. CROET is acting as a leasing agent for OR to attract private companies that may be interested in leasing buildings, space, and equipment at ETTP. The facilities and space are leased to CROET, who subleases them to commercial companies.

[3] According to the OR budget submittal, landlord funding supports nonprogrammatic health and safety issues across the K-25 site. Funding includes upgrades to K-25 facilities to prevent infrastructure deterioration, in support of the East Tennessee Technology Park long-range goals and equipment, and activities required to reduce contamination of the environment and to reduce risks to human health and safety.

- As another part of reindustrialization, OR is negotiating a direct fixed-price contract to decontaminate and decommission three of the major gaseous diffusion facilities (i.e., K-29, K-31, and K-33). This contract includes provisions for the contractor to salvage materials for resale, which may enable the contractor to perform the activities at a lower fixed cost.

The reindustrialization concept is in the early stages of implementation.

At this point, however, the concepts are in their early stages of development. Through the first five ETTP leases, the concept of lessees contributing to the cleanup and decontamination and decommissioning of facilities has not materialized. The work activities and production being performed by these five companies are not directly related to decontamination and decommissioning or environmental restoration of the leased facilities. Lease revenues are apparently being channeled back into the community by CROET as permitted by the leases. The facilities and spaces have been provided to CROET for a nominal fee (which has been waived), although DOE recovers some costs because lessees pay a portion of the cost of utilities and building maintenance.

Some DOE managers expressed the opinion that because "the decontamination and decommissioning of facilities one at a time did not work," reindustrialization is the answer to cleaning up the site. Reindustrialization may eventually contribute to the cleanup of site facilities with reuse or leasing potential. However, indications are that as facilities continue to degrade, any proceeds from leasing would not be applied to decontamination and decommissioning of higher-risk facilities slated for demolition.

EM has questioned the use of funds appropriated for cleanup of gaseous diffusion processes for economic development and has directed some changes.

EM has, in the past, questioned the appropriateness of using funds specifically appropriated for cleanup of gaseous diffusion processes for economic development, and has directed some changes accordingly.[4] EM and OR believe that the current practices of funding reindustrialization as part of decontamination and decommissioning are appropriate based on their judgment that reindustrialization is not an economic development activity because of its potential to contribute to accelerating decontamination and decommissioning.

Although the reindustrialization effort at ETTP has considerable support and potential, concerns were identified with its initial implementation. Regulators, members of the community, and former K-25 workers have raised concerns about the safety and health risks to private-sector workers on a site that still contains legacy hazards and contamination.

Resource and Planning Issues

There are significant unresolved issues with leases and verification of compliance with ES&H requirements.

The initial effort to demonstrate progress under reindustrialization over the past year has resulted in the leasing of space to private companies and public workers by OR and CROET prior to clearly identifying roles and responsibilities, DOE liabilities, DOE jurisdiction and oversight, and the applicable ES&H requirements. Some of the issues that require attention are:

- The respective roles, responsibilities, liabilities, and authorities of DOE and external regulators (i.e., the Occupational Safety and Health Administration, the U.S. Environmental Protection Agency, and the State of Tennessee) for activities in leased space have not yet been clarified, creating confusion within OR management. Managers asked about DOE's responsibility and liability for these private company workers provided widely

[4] 1) Memorandum: August 29,1996; From: J. Fulner, EM-42; To R. Nelson, OR. Subject: Costs of the Small-Scale Metals Recycle Project, w/attachments. 2) Memorandum for All Headquarters and Field Organizations; From: Thomas Grumbly, Under Secretary; Subject: Guidance on Funding for Economic Development Activities. October 8, 1996. 3) Memorandum for Robert W. Degrassee, Jr. Director, Office of Worker and Community Transition; From: Assistant General Counsel for General Law; Subject: Guidance on Funding for Economic Development Activities and Landlord Activities.

varying answers, from "DOE is fully responsible and liable" to "DOE has absolutely no responsibility if they are performing non-DOE work." OR has been working with the U.S. Environmental Protection Agency (EPA) and the State of Tennessee during the past year to more clearly define the role of external regulators in reindustrialization.

- The Occupational Safety and Health Administration (OSHA) has declined to perform oversight of lessee industrial safety due to staffing limitations, but DOE has not effectively defined and communicated roles and responsibilities to all involved personnel. Currently, OR is working with the lessees to assist them in meeting their lawful requirements.

- DOE has not made a final determination whether workers from private companies performing non-DOE work are considered members of the public or site workers. This is an important classification when determining applicable safety requirements, liabilities, DOE involvement, and training requirements.

These issues remain unresolved as OR and CROET seek to lease additional shared space. OR is preparing more modifications to existing lease agreements to include some provisions related to ES&H responsibilities and authorities and is crafting new language for future leases. However, it is not clear that these actions will absolve the Department of future liabilities or that current and future lessees will find ETTP space financially advantageous despite reduced-rate floor space and available machinery and equipment.

In June 1997, OR decided that it was necessary to add a chapter to the draft reindustrialization implementation plan to address questions from regulators about the adequacy of controls in the leased spaces to prevent spread of contamination and/or protect the workers. This initiative includes controls in essential ES&H areas such as radiological protection, health and safety, industrial hygiene, criticality safety, fire protection, and emergency planning. In addition, a recent point paper (June 1997) indicates that OR must implement one of four various types of line oversight and address questions about ES&H that apply to lessees and DOE's mechanisms for ensuring compliance.

Increased Site Access Issues

As ETTP continues to move quickly into reindustrialization, the site is being made more accessible. Under the current security arrangements, lessee workers and vendors, once they have passed through the security gate, have free access to areas within the controlled space except locked or barriered buildings. A secondary control with additional security guards prevents free access to the area of the site that contains the largest uranium enrichment process equipment and other supporting facilities (i.e., Buildings K-29 and K- 1131). This secondary control is present to prevent access by unauthorized personnel. Public site tours for potential lessees also frequently tour the site and facilities. There is also a movement toward further reduction in restrictions on public access and redefinition of the controlled area.

Radioactive, chemical, and physical hazards need to be addressed as the site is made more accessible to the public.

This increased access by members of the public and the move to open the site as a technology park for general access before it is cleaned up raise several concerns. For example:

- The site laundry, which is now shut down, was formerly used to launder contaminated clothing. The laundry's large lint exhaust fans discharged adjacent to a commonly traveled path to the cafeteria. In questioning whether this area might be contaminated, an Oversight team member and an LMES radiation technician surveyed the area. The area was found to be radiologically contaminated and was subsequently roped off, expanding the existing posted area. Through additional review, the Oversight team determined that this area had been surveyed for contamination and downposted (access restrictions relaxed) about two years earlier. Either these surveys were not adequate, or contamination has spread since then.

- The site has over 36,000 feet of process and heating steam lines, most of which are elevated and adjacent to sidewalks and roads utilized by site workers, lessee workers, and visitors. Most of these steam lines are very old, some in excess of 50 years, and have not been subject to non-destructive

examination (e.g., ultrasound) or an erosion/corrosion control or aging management program. Industry experience has demonstrated failures of steam piping of this age, particularly in elbows and restrictions, and the failures have resulted in property damage, injuries, and even fatalities. The potential for these failures at ETTP was demonstrated during the course of this assessment, when a feedwater line burst at the steam plant due to corrosion and thinning of the pipe wall.

Figure 3 shows the location of the leased areas at the site, as well as the laundry and cafeteria.

Leased Space Issues

Two private companies are leasing and using space within Building 1401, which was originally used for maintenance activities (see Figure 4). However, these buildings have not been fully decontaminated and have not had legacy physical, chemical, and biological hazards characterized and mitigated to facilitate private-sector worker access.

Lessees use "clean" areas within contaminated buildings.

The spaces used by these companies were cleaned by scraping, "chipping out," and painting sections of floors and lower portions of walls (below 8 feet) known to be contaminated. Radiological surveys were then conducted to determine whether these areas could be "downposted," indicating that they are not contaminated. There are several concerns with the approach used to clean and downpost these leased spaces within contaminated buildings:

- The radiological surveys that were used to "downpost" the cleaned areas were not performed in accordance with ETTP requirements as indicated in Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 120 (h) documentation, amended to the lease agreements.

- A significant part of the remainder of the building, such as areas above 8 feet, and adjacent main floor areas, remain posted as contaminated, and portions of the basement as highly contaminated. "Highly contaminated" is defined as more than 100 times the limits established for noncontaminated areas.

The basement, located under the northwest corner of the building, contains several hazards, including fixed and removable radiological contamination, loose asbestos, contaminated groundwater, and fissile materials. Potential air and water pathways between this basement area and the floor above (including leased building spaces) include the heating, ventilation, and air conditioning (HVAC) system; doors that have been missing since at least 1985; and broken and missing transite (which contains asbestos) air duct panels, which were identified in a 1990 LMES self-assessment as needing repair. Water leaking from building air conditioners was observed on two separate occasions leaking down into high contamination and loose asbestos areas. ETTP management took appropriate temporary actions to mitigate these issues when they were identified by the Oversight review team. However, these issues had been reported previously and not corrected prior to leasing these spaces. See text box for other concerns related to Building 1401.

While site workers encounter similar conditions on a routine basis, public workers have not had the extensive training provided to site workers, which enables the site workers to identify and avoid potential hazards. The potential health and safety liabilities of the present condition of the K-1401 basement upon other building occupants (including lessee workers) has not been fully assessed or mitigated by OR. In addition, the occupancy of clean spaces in contaminated buildings by private sector workers will inhibit the required decontamination and decommissioning of the contaminated spaces (e.g., decontamination and decommissioning could generate dust).

External regulators have expressed concerns with the lease arrangements.

Both the EPA and the State of Tennessee regulators have expressed concerns with the rapid implementation of reindustrialization, and particularly the leasing of shared spaces within radiologically and chemically contaminated buildings. EPA declined to concur with recent OR requests to lease additional shared spaces within Building K-1401, because they viewed the

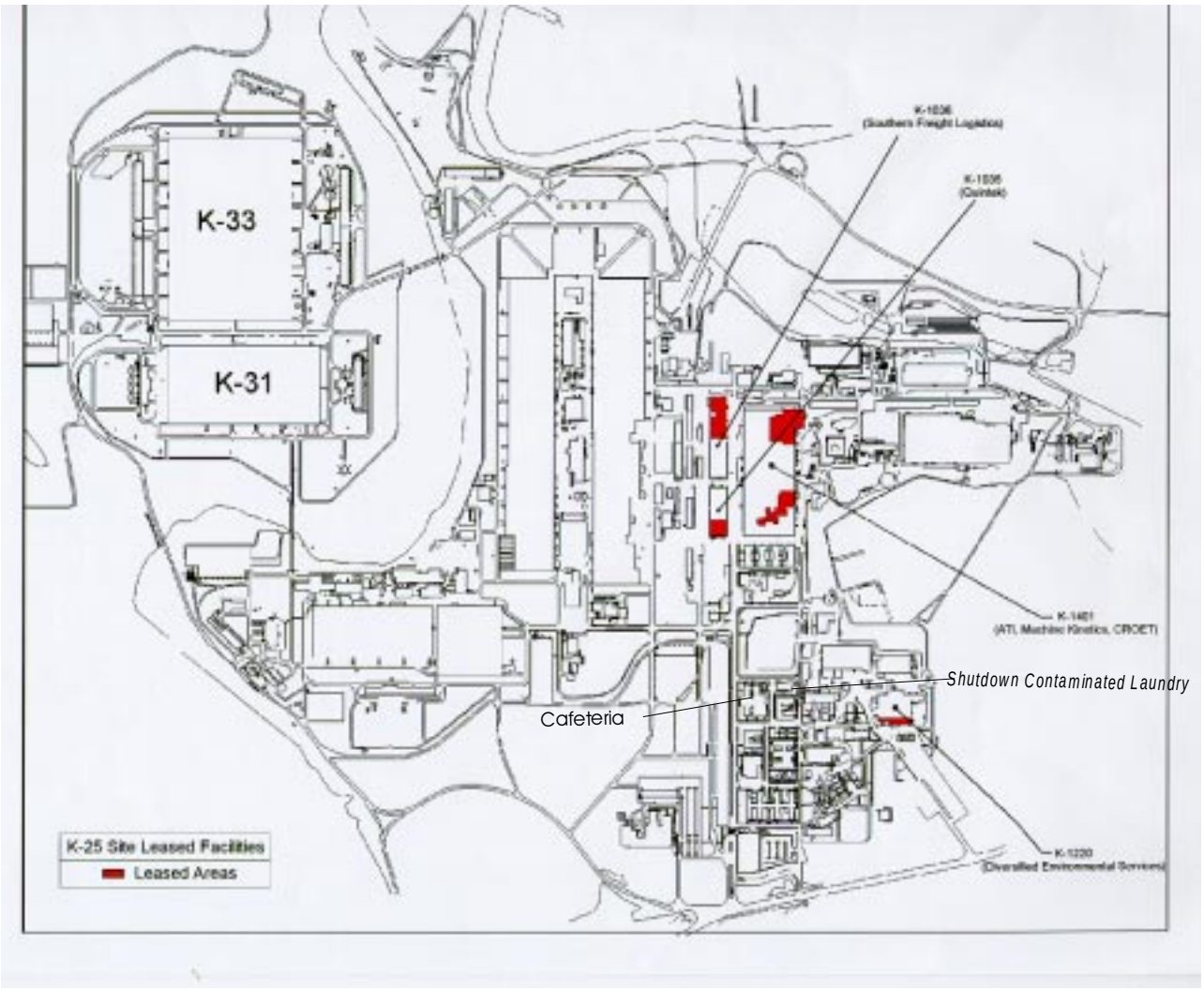
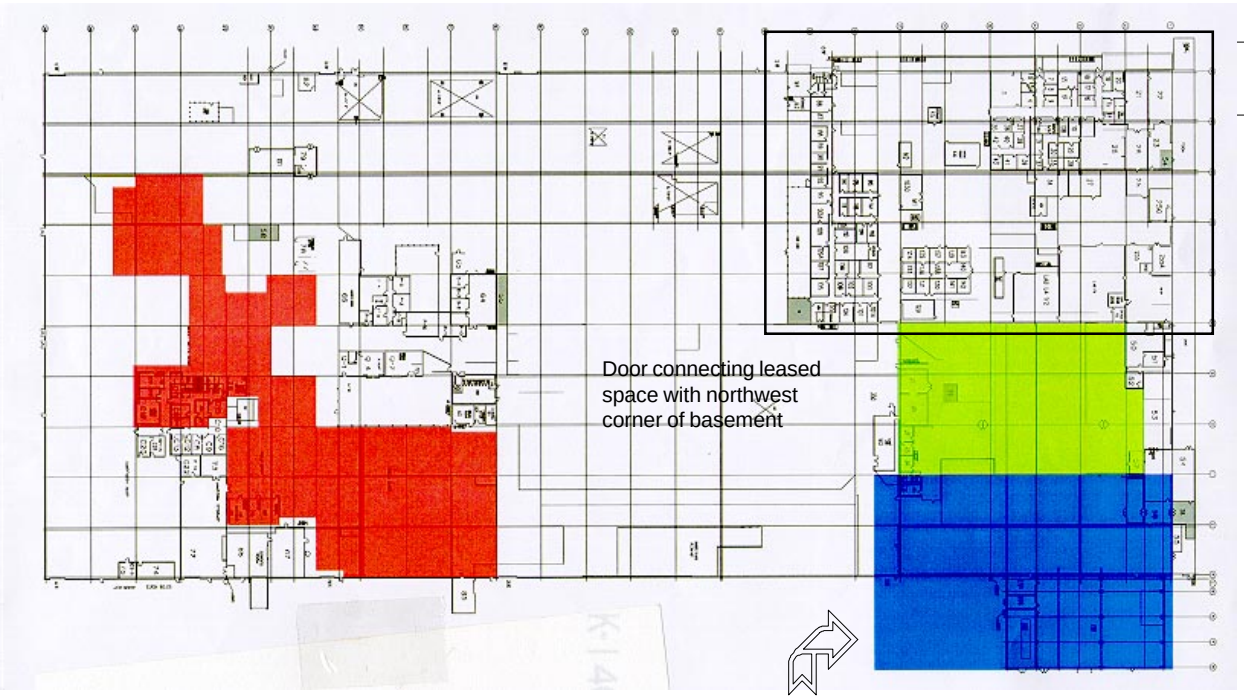
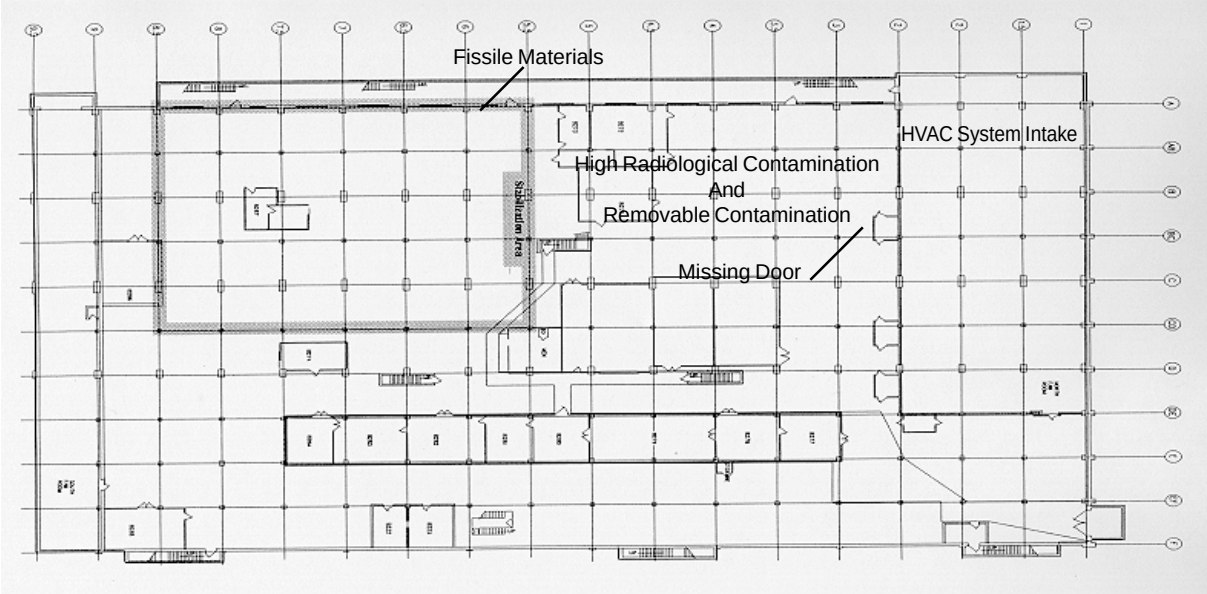


Figure 3
Site Schematic
Showing Leased Areas



K-1401 FIRST FLOOR

This space is available for sublease from CROET but not currently leased.



North

FIGURE 4
BUILDING K-1401
SCHEMATIC-FLOOR AND BASEMENT

survey and characterization of radiological and chemical hazards as inadequate or incomplete. Correspondence from State of Tennessee, Department of Environment and Conservation, stated that the radiological material license concept is not currently workable in shared spaces as currently configured: "We believe as we did originally, that the only way to proceed in licensing a facility is to either license or control the entire facility under one regulatory entity or to hardwall off (includes separate ventilation, etc.) the areas to be licensed. For areas to be leased to nonradiological operations, the entire area should be decontaminated to free-release standards."

OR managers indicated that the decision to lease shared space in K-1401 was driven by economic considerations and that funds were not available to fully remove hazards and decontaminate it prior to leasing. The OR and ETTP expenditure strategy is to make only those repairs necessary to transfer the space to the private sector, so that as much of the decommissioning effort as possible can be paid by the lessee. The objective is to lease buildings so OR can reduce costs and perform further tasks to improve unused space for other reindustrialization opportunities.

Summary of Concerns Related to Leasing Areas Within a Contaminated Facility (K-1401)

Radiological Protection Concerns

Insufficient planning for radiation protection issues to accommodate leasing activities:

- Radiation protection program not revised and submitted to DOE for approval as required.
- Roles, responsibilities, and interfaces for radiation control support not defined.
- Methods and criteria for radiological surveys not adequately defined and not sufficient, considering that private sector workers have routine access to the area.
- Methods for routine monitoring of lessee spaces and outgoing products not defined and not performed.

Inadequate identification and implementation of general employee training for private sector workers.
Insufficient controls to ensure that lessee activities do not disturb contaminated areas within buildings and thus spread contamination.

Industrial Safety and Hygiene Concerns

Insufficient initial and baseline hazards characterization of existing chemical, physical, and biological hazards of all work areas or operations to identify and evaluate potential worker health risks (DOE Order 440.1).
Safety and health hazard information associated with other building spaces is not adequately communicated to lessees.
Inadequate definition of DOE safety and health oversight roles, responsibilities, and interfaces.
Insufficient safety and health controls to ensure that lessee does not disturb asbestos on pipes and walls.
Ineffective program to control and monitor hazardous chemical and compressed gas usage within the building.

Concerns Associated with Planning and Establishing Controls

The potential for transport of radiological and chemical hazards from the basement was recognized but not corrected prior to leasing.
The controls necessary to protect current or future lessee workers, including a proposed lease of space immediately above the basement, have not been defined or implemented.
Occupancy of Building 1401 by lessee and office workers makes the cleanup of the basement (including removal of high contamination, asbestos, fissile materials, and contaminated water) more difficult and a potential impact on the health and safety of lessee workers.

Headquarters Involvement

Consistent with DOE's initiatives over the past few years to empower field management, the EM Headquarters project management role has diminished. Some EM Headquarters managers expressed confusion over changing roles and responsibilities for ETTP activities and performance, and their decreasing level of participation in the management of site projects such as decontamination and decommissioning and reindustrialization. The benefits of empowering field management are well known; however, it would also seem essential to continue an adequate level of Headquarters participation to ensure the long term interests of DOE, including the "Ten Year Plan" (also known as the 2006 Plan), are met. For example, it is important to ensure that local priorities, such as reindustrialization, are properly balanced against DOE's national priorities and potential liabilities.

The pace of reindustrialization efforts needs to be examined to ensure that safety-related issues are addressed.

In summary, the reindustrialization concept, including the leasing of ETTP buildings and equipment, appears to have significant potential for business and community development, the creation of new job opportunities for site and public workers, and possibly the generation of additional resources and funding to support the decontamination and decommissioning of facilities. However, the alignment of ES&H with the move toward reindustrialization must be done in a manner that ensures community support and acceptance for the program and the safety of private-sector workers, addresses unanalyzed liabilities for DOE, and includes effective line management oversight of safety performance.

Key Questions That Need To Be Answered About Reindustrialization and Leasing

What are DOE's line management oversight responsibilities, authorities, and liabilities?

- How will DOE maintain the authorization basis and control lessee use of hazardous materials and chemicals?
- Do leases and subleases adequately define DOE responsibilities and authorities, specific ES&H requirements, line management oversight authorities, and accountability for lessee ES&H performance?

What ES&H requirements pertain to private sector workers in buildings not released for unrestricted use?

- How are these requirements to be determined and enforced?
- Are private sector workers subject to DOE ES&H requirements?
- Are private sector workers subject to requirements for the general public or for co-located site workers?

Should lessees occupy spaces only within buildings deactivated and decontaminated for unrestricted access?

Should lessees be required to report accidents and events on the DOE Occurrence Reporting and Processing System (ORPS)?

Who is responsible for cleanup of materials, such as hazardous solvents and chemicals, that are used in conjunction with commercial activities conducted on government property?

Should products produced by lessees within buildings that have not been fully decontaminated be monitored to ensure that potentially contaminated materials do not leave the site?

Corrective Action and Issue Management

A limited review of the recent fatality at ETTP, corrective plans, and related precursor events was included within the scope of the review. A fatality at a gaseous diffusion plant occurred during welding and burning activities to remove a converter. The worker, in two pairs of anti-contamination clothing and a respirator, was working alone and his clothing caught fire, resulting in his death. This event is indicative of the significant and unique hazards associated with decontamination and decommissioning activities—hazards that are not well encompassed by existing hazards controls and experience that are based on operational activities. There was also concern with the Oak Ridge Reservation and LMES corrective plans to the Type A accident investigation. The focus appeared to be on failure to report anti-contamination clothing fires rather than the fact that there were previous anti-contamination clothing fires reported within the Oak Ridge sites. DOE and LMES management are not effectively acting on those events, including establishing an infrastructure that effectively translates lessons learned to corrective actions, and management followup to assure understanding, acceptance, and sustained implementation of corrective actions. There was also concern that supervisory and work control issues, as well as management followup concerns, identified by a Type A investigation of a life threatening electrical burn accident at Y-12 in 1994, had not been effectively corrected and applied by OR and LMES to other OR sites such as ETTP. Similar work control and supervisory issues were also identified by a Type A accident investigation of a fatality involving the failure of lifting straps for a large tank in 1992.

Because of the similarities in the causes of the three serious accidents, as well as similarities between the latest fatal accident and previous anti-contamination clothing fire events, the Oversight team reviewed selected aspects of the OR and LMES corrective action and lessons learned processes. The review focused on the response to the recent accident and the processes for analyzing accidents and events to identify potential enhancements and lessons learned that could prevent recurrences and similar accidents in the future.

Historic Weaknesses in Corrective Actions and Lessons Learned Evident from the Recent Welding Accident

The 1997 fatality pointed out a number of weaknesses in the OR and LMES safety management system, including problems in work planning, identifying and implementing corrective actions, and effectively disseminating lessons learned. A number of safety management system weaknesses identified in the 1992 and 1994 Type A investigations were again very evident in and contributed to the 1997 fatality:

- Untrained and unqualified craft personnel supervised, or failed to supervise, the work. Downsizing was blamed for an untrained carpenter backup supervisor directing the electrical work on the day of the 1994 electrical burn accident. The supervisor in the 1997 event had never supervised welders before and had not received training on the use of burning permits. Downsizing and reorganizations were also blamed in both cases for unclear project roles, reporting lines, and authority. The end result was that supervision, which should have been a barrier to the accidents, was inadequate and ineffective for these two events. These supervisors did not walk down the planned work before signing permits, did not attend job pre-briefings, did not ensure proper safety precautions and equipment, and did not supervise work in progress. This is a management weakness with implications for additional LMES downsizing and the upcoming transition to a management and integrating contract.

- In all three of the accidents, there was an excessive reliance on "skill-of-the-craft" to accomplish the work instead of approved procedures, permits, and work packages.

- Work planning and hazards analysis and control, such as pre-job briefings, personal protective equipment, work packages and procedures, and job hazards analysis, were inadequate in all three accidents. Specific deficiencies included the failure to obtain an electrical lockout/tagout in 1994, and the failure to establish a fire watch in 1997.

Historically, lessons learned have not resulted in corrective actions except in limited circumstances.

There has also been a tendency at ETTP, and more generally within the OR complex, to implement corrective actions only at the location where an accident or near miss has occurred. Failure to consistently capture or analyze information about near misses and develop appropriate controls to prevent recurrences of identified weaknesses has also been evident.

The 1997 accident also points out a number of instances where events or near misses involving fires and burns to personnel wearing anti-contamination clothing (which is normally made of a material that burns readily but can be purchased in a fire-retardant material) were not raised to management. In addition, three events at three different OR sites involving anti-contamination clothing fires were reported to OR and LMES managers, but the management infrastructure and processes for disseminating information did not produce actions that were sufficient to prevent the 1997 fatality:

- **Paducah Gaseous Diffusion Plant.** As part of a 1992 anti-contamination hood fire event followup, LMES evaluated the advisability of using fire-retardant anti-contamination clothing and hood when welding. The conclusion of the accident investigation report was: "There is no advantage to wearing fire-retardant anti-contamination clothing. It is not readily identified, and in many cases, is out of stock in field locations."

- **Portsmouth Gaseous Diffusion Plant.** In January 1993, a welder's anti-contamination clothing caught fire. In April 1993, the welder filed an employee complaint because he felt that management had not responded adequately to the fire. As a result of the employee complaint, the LMES Portsmouth Health Physics Department ordered new fire-retardant anti-contamination clothing for use at the site. Also, aluminized Kevlar sleeves and leggings were ordered to prevent molten metal from burning through worker clothing.

- **ETTP.** In April 1996, a welder performing decontamination and decommissioning work in Building K-31 received second-degree burns while wearing double anti-contamination clothing. The injury occurred while the worker was removing a compressor in a confined space between two pipes; these working conditions were very similar to the 1997 anti-contamination clothing fire and fatality. This event was not reported into the DOE Occurrence Reporting and Processing System (ORPS) so that lessons learned could be shared and appropriate corrective actions identified and implemented.

These events represent missed opportunities to recognize the hazards posed by non-fire-retardant clothing and to apply these lessons at other LMES and DOE sites. The fatality that followed these precursors occurred after information from the previous events at Paducah, Portsmouth, and ETTP had been reported to OR and LMES management; this information was not analyzed or acted upon.

The 1997 Type A accident investigation report also noted that a number of events involving welders' clothing catching on fire and similar incidents were not reported to LMES management or to DOE as near misses through the occurrence reporting system.

OR and LMES do not effectively communicate lessons learned.

These events and the corrective actions taken and lessons learned in the case of the Portsmouth fire, including the use of flame retardant anti-contamination clothing and Kevlar leggings and sleeves, had the potential to prevent or mitigate the 1997 welding fire fatality. Although some DOE and LMES managers were aware of these precursor events and lessons learned, they had not effectively disseminated lessons learned and implemented corrective actions beyond the immediate locations where the accidents occurred.

Enhancements Resulting from the 1997 Accident

The history of accidents demonstrates the need for better work planning, hazards analysis, and work controls at ETTP. The recent LMES Corrective Action Plan to the 1997 welding fatality appears to be comprehensive and responsive to issues identified on previous accidents, including the need for better work planning and control. It addresses necessary

management corrective actions beyond the narrow confines of welding and anti-contamination clothing fires, such as increased involvement by crafts workers. The corrective actions appropriately clarify roles and responsibilities and encourage the reporting of events and near misses to management. In addition, the Oil, Chemical, and Atomic Workers Union has been working closely with LMES management to improve safety management. The Union has established the "Take Two" program at ETTP, which calls for individuals performing hazardous work, such as electrical switching, to take two minutes to evaluate or self-check safety before starting work.

Potentially effective enhancements to safety management have been identified.

If the corrective actions and Take Two program are effectively implemented and sustained, there should be significant improvements in work planning and control and other elements of safety management. However, the effective implementation of these safety management improvements is complicated by the impending transition to a management and integrating contractor, privatization of decontamination and decommissioning activities, and the phasing out of LMES on the ETTP site. Collectively, these changes will result in a significant turnover of personnel and reassignment of responsibilities, which will result in a period in which personnel are becoming familiar with new and unfamiliar duties and new methods of working and interacting. This transition is likely to be particularly challenging because of the large number of new contractor organizations (each of which brings its own methods and approaches) and weaknesses in the existing standards and procedures. While the transition will undoubtedly involve significant challenges, it also brings an opportunity to make significant improvements to the site safety culture, including enhancing the formality and rigor of operations and improving work planning, hazards analysis, and work controls.

Corrective Action Program Status

LMES uses a computer-based risk ranking system to identify and maintain a data base of information on the status of required corrective actions to resolve deficiencies that result from formal appraisals, assessments, evaluations, or audits. Issues are scored and ranked, and upon validation by appropriate facility or project managers, are translated to corrective actions that are tracked within the system as open, overdue, or on hold. The lessons learned system is linked to the issues management system and includes a system for distributing alert items that uses color coding to indicate priorities and response requirements. These "alert items" are circulated to managers for their review.

Corrective action management systems need further enhancement.

Although the corrective action management system has many positive attributes, there are aspects that require attention. The system does not currently capture employee safety concerns, although it is being extended to include them in the near future. Recommendations identified by LMES safety and health professionals in internal correspondence are not captured by any formal corrective action system and therefore are not tracked, trended, or risk-ranked. The effectiveness of the lessons learned system has not been evaluated by LMES with respect to capturing and disseminating information and tracking corrective actions. Historically, the lessons learned system has not been effective in capturing information about events or near misses and translating that information into effective corrective measures. Weaknesses in the management infrastructure, including information systems, systems for ensuring that individual managers are accountable, and processes for communicating between and within OR sites, have contributed to the deficiencies in the lessons learned systems.

Another weakness is that OR safety and health professionals and Facility Representatives (who are OR personnel assigned to monitor specific facilities) do not make effective use of issue management tracking systems. Deficiencies and corrective actions tend to be conveyed verbally or by memorandum, and are seldom tracked or trended. This informal approach may reflect a historical tendency toward informal communication and interfaces at ETTP. For example, in 1996, the Facility Representative for K-1401 identified that Material Safety Data Sheets were out of date; this situation was not tracked or corrected.

Accident and event reporting also deserves additional attention. In some cases, LMES is not performing ORPS critiques in accordance with DOE Order 5480.19, Conduct of Operations. The timely collection of written employee statements and event

critiques is an essential element in conducting event investigations and root cause analyses.

Attitudes toward reporting events need to be reexamined.

More generally, there is a tendency to use the ORPS reporting system only when it is clearly mandatory to do so. Currently, significant events that do not meet the formal criteria for reporting to ORPS, such as near misses and chronic incidents, are not being systematically captured, retained, evaluated, and applied to enhance LMES and DOE operations. For example, a near miss event involving falling concrete tiles in the K-25 Building was not reported to ORPS, although someone working below could have been seriously injured, and the event highlighted the deteriorating condition of roofs, which has applicability to other buildings at ETTP. Another ETTP near miss that was not reported to ORPS (but was reported to medical services) involved an induced voltage shock to a lineman working with an ungrounded de-energized cable about 60 feet away from a parallel energized 161 kilovolt line (a similar event resulted in a fatality to a Bonneville Power Administration worker). There was also an initial reluctance to report two events that occurred during this Oversight evaluation (the identification of additional contamination outside the laundry, which was discussed previously in this report, and the rupture of a feedwater pipe due to aging and corrosion), both of which had potential broad implications for the ETTP site (e.g., there are many miles of aging and corroding pipe at ETTP, the rupture of which has potential to cause injury or death).

Although a review of reports did not indicate specific instances where LMES failed to report an event that clearly required a report, the prevailing attitude of non-reporting whenever possible should be examined, and consideration should be given to taking action to promote reporting events. Such reporting, if accompanied by analysis and implementation of actions to address lessons learned, can benefit other LMES, OR, or DOE sites. For example, the ORPS reports are an integral source of information for EH's program for providing information and lessons learned through mechanisms such as the Operating Experience Weekly Summary, which is a tool used by most DOE sites to keep informed and disseminate lessons learned in a timely manner.

A number of factors contribute to decisions not to report events. Most notably, OR and LMES personnel indicated concerns about "number counting" and overreaction by EM. Such concerns were also evident at many other DOE sites, indicating that there is a pervasive reluctance to report events because of a perception that DOE program offices use the number of reported events as an indicator of performance, and view a significant number of reported events as indicating poor performance. This points to a need for DOE to reexamine barriers to open reporting.

Another factor affecting reporting is the recent changes in the DOE order for reporting events. The revisions were made, in part, to reduce the reporting of very minor events which tend to congest the system and provide little valuable information. In some cases, however, the revisions have also had a negative impact in that criteria for reporting are more ambiguous, and thus there is considerable flexibility and judgment involved in deciding whether an event or near miss needs to be reported. Consequently, there is potential for considerable variation in reporting practices from site to site and among different individuals. Correspondingly, there is an increasing trend for sites to be reluctant to report events and near misses and to use the revised and more flexible criteria to justify not reporting potentially significant events. Ideally, events should be reported if other elements of the site or other sites could use that information to prevent unnecessary recurrences of events. Consideration should be given to providing examples of the types of events that should be reported, as well as placing less emphasis on counting the number of events at Headquarters, and more emphasis on motivating sites to analyze events and implement corrective actions in response to lessons learned.

Some progress in work planning has resulted from corrective actions in response to the recent fatal accident. Ongoing actions, such as those identified in the Corrective Action Plan for the 1997 fatality, "Take Two," and "I Care, We Care" (which can help ensure that relevant safety-related information on employee concerns and near misses is captured), are promising but are still in the early stages of implementation. The current level of cooperation between LMES and the union in such areas as enhanced work planning, "work smart" standards, and integrated safety management is also encouraging.

3.0 Opportunities for Improvement

Although ETTP has made progress in some areas, most notably successful demolition of the power plant and the cooling towers, the overall conclusion of this review is that the safety management and decontamination and decommissioning programs are not effectively mitigating or reducing site hazards and risks at facilities awaiting demolition. In fact, hazards and future cleanup costs may be increasing as a result of recent ETTP line management decisions, such as deferring decontamination and decommissioning and reducing surveillance and maintenance at higher-risk facilities.

Opportunities for Improvement

The safety management review conducted by the Office of Oversight identified three major areas where improvement is needed. Under each area, the applicable key issues identified during the course of this review are reiterated. For each issue, specific opportunities for improvement are identified. These opportunities should not be viewed as requirements or prescriptive solutions. Rather, these opportunities are derived from experience and lessons learned and are provided for line management's consideration and use as appropriate and as permitted by line management priorities and available resources.

1. **The ETTP decontamination and decommissioning and surveillance and maintenance programs need increased EM and OR management attention, prioritization, and resources to assure safe and timely disposition of high risk buildings.**

Issue: Higher-risk facilities are not being maintained in a manner that assures the safety of workers and the ability to decontaminate and decommission safely and at a reasonable cost at a later date.

Opportunities for Improvement

- Apply the guidance contained in the EM policy on facility disposition, the DOE order on assets management, the draft DOE order on the disposition of surplus facilities, and the EM implementation guide to assure that high-risk facilities and facilities containing hazards are placed into the recognized life cycle phases of shutdown, deactivation, or decontamination and decommissioning.

- Define specific criteria to be met before placing facilities into an extended decontamination and decommissioning status (e.g., physical condition, surveillance and maintenance requirements, and occupancy limitations).

- Use the DOE-established process to deactivate high-risk facilities or facilities that contain hazards and that cannot be decommissioned for several years; this process should include removal of hazards, measures for safe and stable facility conditions, adequate surveillance and maintenance, and defined end points for acceptance.

- Ensure adequate surveillance and maintenance, including prioritization of the maintenance of roofs on shutdown high-risk or hazardous facilities, to assure the safety of workers in or near the facilities and to allow safe and cost-effective final disposition.

- Strictly control the use of shutdown facilities for occupancy or for the storage of chemicals, materials, or waste to limit surveillance and maintenance costs and to facilitate deactivation and decommissioning.

- Assure that the facility safety authorization basis remains current and reflects changing facility life cycle, physical condition, and hazards through revisions or use of appropriate analyses.

- Maintain the heating, ventilation, and air conditioning systems in an operable condition where deactivation or decommissioning will require work inside the building.

- Strictly limit the "abandon-in-place" concept (if it must be used) to low-hazard buildings that can be demolished from the exterior, such as office buildings, warehouses, or smoke stacks.

- Place a reasonable limit (e.g., five years) on the time a facility can remain in extended and permanent shutdown without being formally deactivated or decommissioned.

Issue: EM and OR are not ensuring that the decontamination and decommissioning program at ETTP is effectively dispositioning high-risk facilities and reducing site hazards on a priority basis.

Opportunities for Improvement

- Clarify roles, responsibilities, and accountabilities for the decontamination and decommissioning program and progress at EM, OR, and the DOE site office.

- Improve accountability for the upkeep of shutdown facilities and decontamination and decommissioning of ETTP through single-point accountability and linking of schedules, milestones, and progress to decontamination and decommissioning managers' performance appraisals.

- Prioritize and conduct decontamination and decommissioning of at least one higher-risk facility on a continuing basis at ETTP.

- Align sequencing of decontamination and decommissioning projects with the risk prioritization system to ensure that the highest risks are eliminated first.

Issue: The addition of reindustrialization to the ETTP mission has reduced management focus and the application of resources to surveillance and maintenance and the decontamination and decommissioning of higher-risk and degrading facilities.

Opportunities for Improvement

- Separate the decontamination and decommissioning program from reindustrialization to assure adequate management focus and the effective allocation of funding and resources designated for the surveillance and maintenance of shutdown facilities, decontamination and decommissioning, and environmental restoration of shutdown facilities.

- Move the BNFL decontamination and decommissioning of the gaseous diffusion plants to the decontamination and decommissioning program until decontamination and decommissioning are complete and the plants are in a condition to transfer back to reindustrialization for leasing.

- Maintain the decontamination and decommissioning of high-risk facilities, such as K-1131 and K-725, under the decontamination and decommissioning program.

- Establish necessary management controls and criteria to assure that resources and funding designated for shutdown facilities (including surveillance and maintenance), deactivation, and decontamination and decommissioning of gaseous diffusion facilities are not applied to the preparation of facilities for lease, unless the lease work being performed is for DOE or involves decontamination and decommissioning of the facility.

2. The reindustrialization program needs to be implemented in a more controlled and systematic manner to assure definition of DOE roles, responsibilities, authorities, and liabilities, identification of ES&H requirements, and effective safety oversight.

Issue: The reindustrialization program at ETTP, including the leasing of buildings, space, and equipment, has been implemented without ensuring that health and safety requirements, accountability for performance, DOE roles and responsibilities, and liabilities are clearly defined.

Opportunities for Improvement

- Continue to work toward defining DOE responsibilities for oversight of lessee worker industrial safety and health performance and mechanisms for accountability.
- Define and communicate whether lessee workers are site workers or members of the public: if lessees are considered members of the public, then determine the adequacy of the authorization basis for adjacent facilities that assume the public is at the site boundary and the potential co-located hazards for these private-sector workers; if lessees are considered co-located site workers, then provide appropriate training on radiation protection, site hazards, and emergency response.
- Incorporate applicable OSHA, DOE, or industry safety and health requirements and accountability into leases and CROET subleases.
- Define applicable requirements and mechanisms to protect lessee workers in areas such as radiation protection, industrial safety and hygiene, chemical safety, fire protection, criticality safety, and emergency planning.
- Consider requiring lessees to report significant events, safety violations, radiological contamination, and onsite accidents to assist DOE in monitoring safety performance, to share lessons learned, and to assist appropriately in limiting DOE liability in injuries related to DOE properties and mechanical equipment.
- Expedite the current OR initiative to define DOE roles, responsibilities, authorities, and line management oversight of lessee ES&H performance.

Issue: The leasing of shared spaces within buildings that have not been fully radiologically decontaminated and contain hazardous chemicals and materials creates potential hazards to private-sector workers, increases DOE liabilities, and has the potential to undermine community acceptance and support of reindustrialization.

Opportunities for Improvement

- For non-radiological, non-DOE work, consider leasing only entire buildings that have been decontaminated, from which hazardous materials and chemicals have been removed, and for which independent surveys have been conducted to ensure suitability for occupancy by private-sector workers.
- Generate a radiological protection program (or modify the existing ETTP radiological protection program) in accordance with 10 CFR 835 for lessees currently working in Building K-1401 and obtain Headquarters approval.
- Consider temporarily removing lessee workers from Building K-1401 or establishing appropriate engineering and administrative controls to facilitate expedited decontamination and cleanup of the basement. As a temporary measure, keep the first floor door to the northwest section of the building closed, locked, and posted.
- Provide monitoring and control over lessees' incoming materials, including hazardous chemicals, and outgoing manufactured products, including potential radiological contamination.

- Provide for adequate monitoring of lessee worker space, particularly in shared spaces, including safety performance, radiological contamination, and air samples in buildings with removable radiological or chemical contamination.

- Ensure that the authorization basis for buildings containing lessee workers, including shared spaces, adequately considers the protection of private-sector workers within these buildings.

- Revisit the risks, liabilities, and appropriateness of leasing additional space within contaminated and potentially hazardous buildings prior to cleanup.

3. The management infrastructure essential to the effective management of issues arising from events, accidents, and near misses needs to be strengthened to assure continuous improvement in safety management and sharing and implementation of lessons learned.

Issue: The management systems and infrastructures have not been effective in achieving continuous input to safety management and the sharing and implementation of lessons learned.

Opportunities for Improvement

- Strengthen DOE and LMES management followup and assessment of the understanding, acceptance, and implementation of ES&H policies, requirements, corrective actions, and lessons learned.

- Establish a DOE and LMES infrastructure to assure that events, accidents, near misses, and lessons learned that are reported to management are appropriately entered into lessons learned systems and distributed to all LMES sites on a timely basis.

- Assure that the feedback loop within integrated safety management is effective in achieving continuous improvement to management systems and programs, including information obtained through performance metrics, event investigations, external inspections, and self-assessments.

- Assure that potential safety management system weaknesses identified as contributing to accidents, events, and near misses are adequately analyzed, tracked, and acted upon.

Issue: Three serious accidents in the last five years, including two fatalities, indicate weakness in work planning and control and the distribution and implementation of lessons learned.

Opportunities for Improvement

- Ensure that issues and corrective actions identified by line management walkthroughs or Facility Representative assessments are captured by the issues tracking system and tracked to effective closure.

- Develop and implement a policy that clearly limits the use of skill-of-the-craft to identified routine, repetitive, and non-hazardous activities.

- Implement the event critique process as defined in DOE Order 5480.19, Conduct of Operations, at ETTP, including obtaining employee written statements and conducting a critique meeting as soon as possible after an event.

- Ensure that permanent or temporary supervisors have completed appropriate supervisory and ES&H training and are responsible for supervising activities only within their field of expertise.

- Continue to expedite the implementation of the corrective action plan for the 1997 fatality, including hazards analysis, work planning and control, and pre-job briefings.

Appendix A
Review Process and Team Composition

The review was conducted according to formal protocols and procedures, including an Appraisal Process Guide, which provides the general procedures used by the Oversight program for conducting inspections and reviews, and the Safety Management Review Plan, which outlines the scope and conduct of the evaluation process. Training sessions were conducted to ensure that all team members were informed of the evaluation objectives, procedures, and methods. The evaluation team collected data through interviews, document reviews, walkdowns, observation of activities, and performance testing. Interviews were conducted with Department of Energy (DOE) Headquarters, Oak Ridge Operations Office, and contractor managers, technical staff, hourly workers, and union representatives. Oversight personnel also met with representatives of the State of Tennessee regulators, Environmental Protection Agency representatives, and groups of concerned citizens to solicit their views and share information about the Oversight process.

Basis for the Review

The DOE safety management approach is based on the fundamental premise that line managers are responsible and accountable for managing environment, safety, and health (ES&H) through proper work planning, hazard analyses, and hazard control. The basis for this Oversight review is a conceptual framework that characterizes the objective, principles, and functions that are essential elements of a sound safety management program. This framework can accommodate the wide range of operations, hazards, and management styles at DOE facilities.

Although Oversight uses the same conceptual framework for evaluating performance as it does on a safety management evaluation, a safety management evaluation has a broad scope, encompassing a wide range of site operations and technical disciplines. The focus of this review was selected to provide safety-related information to the DOE Office of Environmental Management, the Oak Ridge Operations Office, current and new contractors, and other DOE sites. This review is focused specifically on facility disposition efforts at East Tennessee Technology Park (ETTP) and on other areas that were recognized to have deficiencies, such as corrective action programs. This review did not address other aspects of the ETTP mission, such as ongoing waste management activities (including the waste incinerator facility). Similarly, the review did not address ongoing questions related to employee health, which are currently being evaluated by other groups. A number of factors prompted Oversight to focus the review specifically on facility disposition:

- Because of the recent increasing emphasis on leasing facilities to commercial companies, public access to the site has significantly increased, including about 75 people (primarily lessee employees) who have been badged for routine site access. The leasing efforts have brought members of the public inside and in close proximity to potentially hazardous facilities that previously were routinely accessible only to the trained site workforce. ETTP intends to increase the focus on using the site for commercial efforts, thereby bringing additional people to the site.

- The facility leasing and reindustrialization efforts at ETTP have analogues at other DOE sites. For example, a number of other DOE sites have non-DOE tenants or are decontaminating and decommissioning facilities that may be used by non-DOE tenants. In addition, various DOE sites have been increasingly using fixed-price contractors or are implementing efforts to "privatize" activities. These efforts often involve contractual and lease agreement issues, as well as questions about DOE's liability and the role of DOE and contractors in monitoring safety performance and compliance with requirements. These issues are similar to those faced by ETTP. Oversight's evaluation of a facility that has been an Office of Environmental Management site for 10 years and that has considerable recent experience with leasing and non-DOE tenants is expected to provide valuable insights to other DOE sites that are, or will be, facing similar issues.

- DOE has recently disseminated a draft order that, when finalized and approved, will identify, establish, and consolidate requirements related to facility disposition. The review of ETTP at this time is expected to provide important baseline information to establish the actions that will be necessary to achieve compliance with the provisions of the new order. This information will be particularly useful in ensuring that DOE and the new integrating contractor have a firm understanding of the expectations for facility disposition efforts.

- With the changing mission and the preparation for new organizations and contractual arrangements, particular attention is appropriate to ensure that ES&H issues are given appropriate priority and that potential hazards are addressed.

Team Composition

The team members and their and responsibilities are as follows:

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